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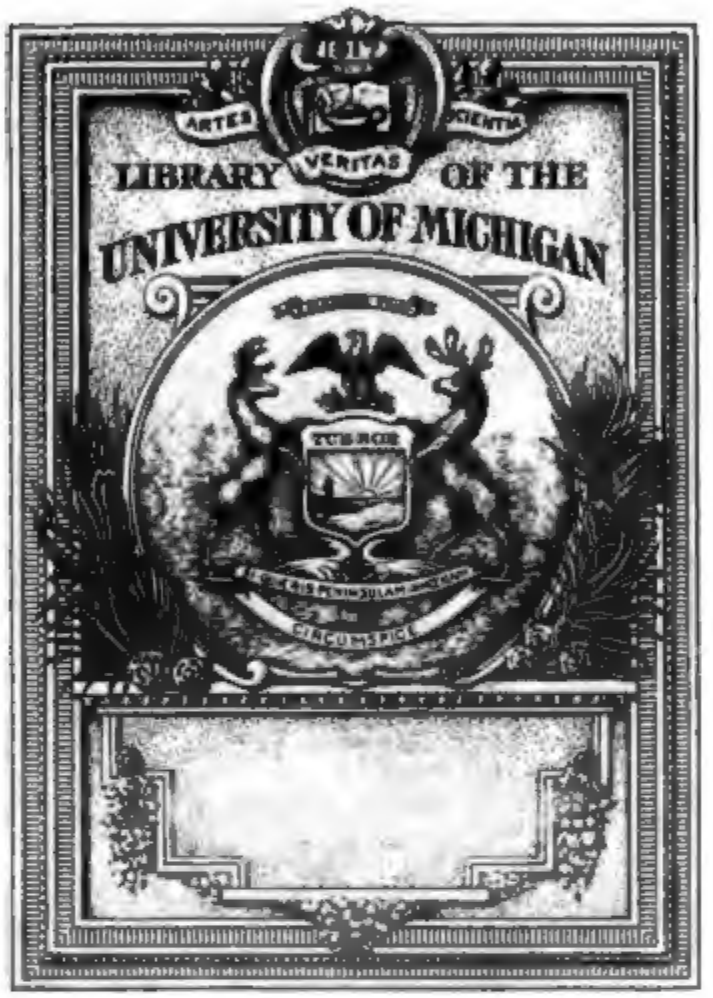

THE GIFT OF
U. S. National Museum

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ANNUAL REPORT

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OF THE

BOARD OF REGENTS

OF THE

SMITHSONIAN INSTITUTION,

SHOWING

THE OPERATIONS, EXPENDITURES, AND CONDITION OF THE INSTITUTION

FOR THE

YEAR ENDING JUNE 30, 1886.

PART II.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1889.

Gift
National Museum

FIFTIETH CONGRESS, FIRST SESSION.

Concurrent resolution adopted by the House of Representatives July 28, 1888, *and by the Senate October* 1, 1888.

Resolved by the House of Representatives (the Senate concurring), That there be printed of the Report of the Smithsonian Institution and of the National Museum for the years ending June 30, 1886 and 1887, in two octavo volumes for each year, 16,000 extra copies of each, of which 3,000 copies shall be for the use of the Senate, 6,000 copies for the use of the House of Representatives, and 7,000 copies for the use of the Smithsonian Institution.

The Annual Report of the Board of Regents of the Smithsonian Institution for the year ending June 30, 1886, consists of two parts, viz:

PART I.—Report of the Smithsonian Institution proper, showing its operations, expenditures, and condition.

II.—Report of the United States National Museum, showing its progress and condition.

REPORT

OF THE

UNITED STATES NATIONAL MUSEUM

UNDER THE DIRECTION OF

THE SMITHSONIAN INSTITUTION

FOR THE

YEAR ENDING JUNE 30, 1886.

REPORT OF THE UNITED STATES NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

SUBJECTS.

PART I.—Report of the Assistant Secretary of the Smithsonian Institution upon the condition and progress of the Museum.
II.—Reports of the Curators.
III.—Reports upon special collections in the National Museum, and papers illustrative of the collections.
IV.—Bibliography.
V.—List of accessions.

UNITED STATES NATIONAL MUSEUM,
Washington, February 1, 1887.

SIR: I have the honor to submit herewith a report upon the present condition of the Museum, and upon the work accomplished in its various departments during the year ending June 30, 1886.

Very respectfully,

G. BROWN GOODE,
Assistant Secretary, Smithsonian Institution,
in charge of U. S. National Museum.

Prof. SPENCER F. BAIRD,
Secretary of the Smithsonian Institution.

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PART I.

REPORT

UPON THE

CONDITION AND PROGRESS OF THE U. S. NATIONAL MUSEUM FOR THE FISCAL YEAR ENDING JUNE 30, 1886.

BY

G. BROWN GOODE,

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION, IN CHARGE OF THE NATIONAL MUSEUM.

REPORT UPON THE CONDITION AND PROGRESS OF THE UNITED STATES NATIONAL MUSEUM DURING THE FISCAL YEAR ENDING JUNE 30, 1886.

In the report now presented, which relates to the year ending with June 30, 1886, it was my intention to have presented a general review of the history of the Museum, and of its several departments. The publication of this historical sketch will, however, be reserved for presentation at some future time.

LIST OF ERRATA.

Page 33, for "Berdell," read "Rerdell."
Page 56, for "T. T. Lamb," read "T. F. Lamb."
Page 56, for "H. M. Meling," read "H. M. Malling."
Page 60, for "Prof. I. H. Morrison," read "Prof. J. H. Morrison."
Page 108, for "J. U. Johnson," read "J. W. Johnson."
Page 253, for "Rufus W. Deering," read "Romyn Hitchcock."
Page 432, for "διαβυσις," read "διάβασις."

after to belong to the United States, which may be in the city of Washington," should be delivered to the Regents of the Smithsonian Institution, and, together with the new specimens obtained by exchange, donation, or otherwise, should be so arranged and classified as best to facilitate their examination and study.*

It was not until 1858 that the actual custody of the "National Cabinet" was assumed by the Regents, and appropriations were made by Congress for its maintenance. During the twenty-three years which followed, the collections were greatly increased and were made the subjects of numerous important memoirs upon the natural history and ethnology of America. The public halls, with their arrangements for the exhibition of a portion of the collections, also received a due share of attention, and a reasonable amount of instruction and pleasure was afforded to visitors. The appropriations however were small, the space limited, and the staff so inadequate, that little could be done except to keep the collections in a good state of preservation.

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*An act to establish the Smithsonian Institution "for the increase and diffusion of knowledge among men." (Approved August 10, 1846; Revised Statutes, Title LXIII. sections 5579–5594.) See also Revised Statutes, section 5586, and Statutes Forty-fifth Congress, third session, chap. 182, p. 894.

The Exhibition of 1876 in Philadelphia was an event of great educational importance to the people of the United States; and not the least of its benefits were the lessons it taught as to the possibilities for good in public museums. The objects which were given to the United States for its National Museum, at the close of the Centennial, were of much intrinsic value, but were still more important, in that they led to the erection of a large building for the expansion of the museum itself.

From 1876 to 1881 was a period of incubation. The museum embryo was developing, but it was within a shell of store-houses. From 1881 to 1886, another period of five years, its growth has been rapid, though the organism is still in its infancy. These five years have been years of experiment, but it is hoped that it is now evident to the people and to Congress that the young museum is now ready to begin a promising progress toward maturity.

Among the most important features of the work, up to the present time, certain definite stages of progress have been attained, among the most important of which may be mentioned:

(1) An organization of the Museum staff has been effected—efficient for present purposes and capable of expansion and extension as occasion may require.

(2) Through the agency of this staff, the materials in the Museum, the accumulations of nearly half a century, have been examined, classified, and brought under control.

(3) The collections have been more than doubled in extent.

(4) A beginning has been made toward the development of a thoroughly labelled exhibition series, available for the instruction of the public.

(5) A thorough study of the organizations and systems of classification in other museums throughout the world has been made, the results of which are beginning to appear in the work of the Museum staff. A report upon the great museums of the world is in preparation and will soon be published.

(6) Many new methods of installation have been developed by experiments in the Museum, and in the expositions in which the Museum has participated. These are finding favor, and are being adopted in many similar establishments at home and abroad, and will certainly add to the economy and success of our own administration.

(7) Science has been forwarded by the publication of many hundreds of papers describing the materials in the Museum, while the work of specialists in the production of these papers has greatly improved the significance and value of the collections.

It is, I think, possible to show that Washington may readily be made the seat of one of the greatest museums in the world. It will perhaps be neither practicable nor desirable to gather together in Washington collections of ancient and mediæval art, such as those which adorn the capitals of Europe; but a representative series of such objects will un-

doubtedly grow up, which shall tend to educate the public taste, and to promote, so far as possible, the study of the elements of art and the history of civilization, as well as to forward the growth of the arts of design. This having been accomplished, the attention of the Museum should be directed mainly toward the exhibition of the geology and natural history of America, and its natural resources, to the preservation of memorials of its aboriginal inhabitants, and to the exposition of the arts and industries of America.

In referring to the industries of America it is not intended to recommend that anything similar to what is generally understood as an "industrial exhibition" should be attempted. The element of competitive display should not be admitted, and no two objects of precisely similar import should ever be placed side by side.

As early as 1851, the scope of the Museum was considered to be a question of great importance; but even now it is perhaps too early to speak definitely in regard to the nature of its future development. The first Secretary of the Institution, Professor Henry, was opposed to the accumulation of extensive collections at the expense of the Smithsonian fund. He did not underrate the importance of great collections, but, on the contrary, deemed it the duty of the Institution to point out the means by which they might be made, and to aid in this work by utilizing all opportunities for procuring specimens for distribution, by facilitating exchanges, and by assisting explorations. He considered the formation of a general collection, although beyond the means of the Institution at that time, an object which ought to engage the attention of Congress, and was firmly convinced that in accepting donations of specimens, preference should be given to those of importance for use in scientific research, the study of which was likely to produce new and interesting results. Professor Baird, taking up the same administrative problem at a later period, and finding the conditions greatly changed, has forwarded enthusiastically the progress of the National Museum, supported as it now is by direct grants of money from the general Government. With the experience of these years it has become evident that the National Museum of the United States will of necessity have features peculiar to itself, developed in response to the peculiar needs of the people of this continent. It should be remembered that the national collections of every principal European nation are divided into several groups, each under separate administration, though often within the general control of some central authority. In France, for instance, most of the museums are under the Ministry of Public Instruction, and in England, to a less extent, under the Department of Science and Art.

In London, in Paris, in Berlin, and in Vienna the public collections are scattered through various parts of the city, in museums with distinctive names, and independent in their organizations. Much of the work which should properly be done by such museums is omitted, because no one of them has seen fit to undertake it; while, on the other

hand, much labor is duplicated, which is perhaps equally unfortunate, collections of similar scope and purpose being maintained in different parts of the same city. One of the chief objections to such division of effort is, that much of the value of large collections in any department is lost by failure to concentrate them where they may be studied and compared side by side. In Washington the national collections are all, without exception, concentrated in one group of buildings. The Army Medical Museum will soon occupy a building side by side with those under the control of the Smithsonian Institution, and this proximity, in connection with the long-established policy of co-operation between the two organizations, will cause them to be, for all practical purposes, united in interest.

It is possible that, in the future, museums of specialties, occupying buildings of their own, may grow up under the control of other Executive Departments of the Government, but it is to be hoped that they will not be very remote from the chain of museum buildings already in process of formation, and that a harmonious system of co-operation will always be found to be practicable.

The National Museum is now approaching an important crisis in its history. Its future will depend upon the action of Congress in granting it an additional building, for without more room its growth can not but be in large degree arrested. From this time forward it will be impossible to develop the collections satisfactorily without additional space. The laboratories and workshops are already entirely inadequate for the storage of the unexhibited collections and the accommodation of the preparators and mechanics, and the exhibition halls do not afford suitable opportunity for the display of the materials already in order for public examination. Each collection, and above all each department, should have a hall of its own, more or less completely isolated from those which adjoin it. It is evident that when several collections are placed side by side in the same department, much is lost in respect to effect and convenience of study, not to mention the still greater disadvantage of overcrowded space.

A.—THE MUSEUM STAFF.

Several changes have been made in the arrangement of the scientific staff during the year. The collection of Cenozoic Fossils is now in the custody of the Curator of Mollusks, the Department of Invertebrate Palæontology having been divided into three groups, corresponding to the three principal periods of geologic time, Paleozoic, Mesozoic, and Cenozoic. Mr. John B. Smith was appointed Assistant Curator of the Department of Insects on August 1, 1885. Mr. Romyn Hitchcock, Curator in the Department of Arts and Industries, was granted leave of absence for two years to visit Japan for scientific exploration, and, having received from the Japanese Government an appointment as

Professor in the University of Osaka, departed on his mission in July, 1886.

Mr. W. V. Cox was designated Chief Clerk in December, 1885. Mr. R. I. Geare has been placed in charge of Correspondence and Reports; and Mr. A. Howard Clark is Assistant in charge of Publications, Stationery, and Labels. Mr. S. C. Brown, as Registrar, has charge of Transportation, Registry, and Storage. Mr. John Murdoch has been designated Assistant Librarian.

By the death, March 19, 1886, of Mr. James Templeman Brown, the Museum suffered the loss of an enthusiastic worker, who had rendered efficient service in the development of the Museum. Mr. Brown had made an exhaustive study of the whale fisheries of the world, and the collection formed by him to illustrate the history of the New England whale fishery, will always be a prominent feature in the fisheries court.

The Museum staff, as now organized, consists of two classes—the scientific officers or curators, and the administrative officers.

There are at present 28 curatorships, some of which are divided, so that the number of heads of departments or sub-departments is 26, and the total number of men in the scientific staff 30, of whom 13 are in the pay of the Museum, and the others are honorary (or unpaid), some being detailed for this duty by the Director of the Geological Survey, by the Director of the Bureau of Ethnology, others by the Commissioner of Fish and Fisheries, and by the Secretary of the Navy, while two are volunteers. These details are in every instance made in the interests of co-operation by those Bureaus of the Government engaged in work closely connected with that of the Museum. The paleontologists of the Geological Survey have found it to be so much to their advantage to have access to the paleontological collections of the Museum and the use of the laboratories, storage cases, and general administrative appliances of the Museum, that they are permitted by the Director to assume the responsibilities of curatorships and perform a general work of supervision. It is intended, however, that the Museum shall provide paid assistants, to relieve the honorary curators of most of the routine work of their departments.

B.—THE CONDITION OF THE COLLECTIONS.

The reports of the curators indicate that the collections under their charge are in an excellent state of preservation.

The perishable objects, such as skins of birds and mammals, the insects, certain ethnological materials, and the objects preserved in spirits, have in most cases been provided with improved case accommodations, and a decided advance has been made in the methods of preventing insect ravages.

During the year the collection of aboriginal American pottery in the northwest court has been opened to the public, and a series of casts of

reptiles has been placed on exhibition in the west range of the Smithsonian building. Almost the entire lower hall in the Smithsonian building has been devoted to the bird collection, though the Department of Mollusks still retains some of its specimens in the table cases between the bird cases in the alcoves. A small series of insects* has been installed in the southeast court of the Museum building, and the osteological collection has been largely extended. The collections acquired by the Museum at the close of the New Orleans Exposition have been received and assigned.

In connection with the administration of the collections, three hundred and twenty-two papers† have been published, of which a tabulated statement, by subjects, is given under the heading of "Publications."

In the report for 1884, when the last census of the collections was reported, the number of specimens in the Museum was estimated at 1,471,000. During the last eighteen months‡ the increase has been, as shown by the following table, 949,934 specimens:

CENSUS OF THE COLLECTIONS.

Estimated number of specimens in the several departments of the Museum, June 30, 1886.

Department of Arts and Industries:	No. of specimens.
Materia Medica	4,850
Textile Industries §	3,064
Fisheries	9,870
Animal products	2,792
Foods†	822
Historical relics	1,002
Paints and dyes †	77
The Catlin Gallery	500
Physical apparatus	250
Oils and gums †	197
Chemical products†	659
Musical instruments	400
Modern pottery	2,278
Coins and medals, paper money, etc	1,055
II. (*a*) Department of Ethnology	§ 500,000
II. (*b*) Department of Prehistoric American Pottery	25,000
III. Deparment of Prehistoric Anthropology	65,314
IV. Department of Mammals (skins and alcoholic specimens)	7,451
V. Department of Birds	55,945
V. (*b*) Department of Birds' Eggs	44,163
VI. Department of Reptiles and Batrachians	25,344
VII. Department of Fishes	75,000
IX. Department of Mollusks (including Cenozoic fossils)	460,000
X. Department of Insects	500,000

* Perhaps one-fourth of the material on exhibition formed the exhibit prepared for the New Orleans Exposition.

† Ninety-five of these papers were prepared by investigators not officially connected with the Museum.

‡ January, 1885, to July, 1886.

§ Estimated.

	No. of specimens.	
XI. Department of Marine Invertebrates		*350,000
XII. Department of Comparative Anatomy		10,210
Skeletons	*1,987*	
Skulls	*6,581*	
Antlers	*89*	
Casts of brains	*34*	
Birds' sterna	*1,519*	
XII. (*a*) Department of Invertebrate Fossils (Palezoic)		80,482
XIII. (*b*) Department of Invertebrate Fossils (Mesozoic)		69,742
XV. Department of Fossil Plants		7,429
XV. Department of Recent Plants		†30,000
XVI. Department of Minerals		18,401
VII. Department of Lithology and Physical Geology		20,647
VIII. Department of Metallurgy and Economic Geology		48,000
Total		2,420,944

There have been no important changes in the assignment of exhibition pace since the last report was prepared. In the hall devoted to the isplay of the materia medica collection, a portion of the collection of od substances has been arranged, and in a corner of the north hall are xhibited a few of the objects collected for the section of steam transortation. A few cases in the north hall have also been filled with oins and medals. The east end of the northeast balcony in the Smithnian building has been occupied by the department of Ethnology i arranging the collection of weapons. There are still several departents to which no exhibition space whatever has been assigned, on ccount of lack of room, and the only remedy is a new additional buildig. A great mass of material is at present stored in the Armory Buildig, and must remain there until Congress has provided more spacious ccommodations for the collections.

CATALOGUE ENTRIES.

The number of entries made during the year in the Museum registers of the several departments is 52,115, are indicated in the following able:

rts and Industries:		
Materia Medica	409	
Textiles	624	
Foods	274	
Historical Relics, Coins and Medals, and Modern Pottery	1,507	
Paints and Dyes	41	
Oils and Gums	112	
Chemical Products	38	
Fisheries and Animal Products	226	
		3,231
thnology		1,344
merican Prehistoric Pottery		3,235
rchæology		647
ammals		407
irds		4,147

*Duplicates not included. †Exclusive of Professor Ward's collection.

Birds' Eggs		253
Reptiles and Batrachians		444
Fishes		662
Mollusks (including Cenozoic Invertebrate Fossils). The total number of entries is made up from nineteen different series)		18,638
Insects		1,490
Marine Invertebrates (excepting Mollusks):		
Crustaceans	1,483	
Worms	238	
Tunicates and Bryozoa	284	
Radiates	3,741	
Sponges and Protozoa	1,328	
		7,074
Comparative Anatomy:		
Mammals	407	
Birds	288	
Fishes	137	
Reptiles and Batrachians	185	
		1,017
Invertebrate Fossils—Paleozoic		610
Invertebrate Fossils—Mesozoic		1,563
Fossil Plants		15
Recent Plants		40
Minerals		772
Lithology and Physical Geology		1,021
Metallurgy and Economic Geology		5,506
		52,116

C.—REVIEW OF THE YEAR'S WORK IN THE SCIENTIFIC DEPARTMENTS.

DIVISION OF ANTHROPOLOGY.

DEPARTMENT OF ARTS AND INDUSTRIES.

The collection of textiles is installed in the northeast court of the Museum, and is provided with printed labels and illustrative diagrams: it includes a very full series of the animal and vegetable fibers of the world, together with devices for spinning and weaving, and the various products of the textile industries.

Much of the material intended for exhibition can not be installed in the now limited space available, and is stored away in boxes until increased space will warrant its display.

A few cases containing food specimens are on exhibition, and the composition of the human body is graphically illustrated, together with its daily expenditure of tissues, and the manner in which this is compensated for by daily rations of food. This collection is exhibited upon the plan of the famous collection of similar character prepared by Dr. Lankester and others for the Bethnal Green Museum in London. It is, however, based upon an entirely new series of analyses and a revised plan prepared by Prof. W. O. Atwater, of Wesleyan University.

The section of materia medica is under the charge of Dr. H. G. Beyer, U. S. Navy, who has been detailed for this work by the Surgeon-Gen-

eral of the Navy, under whose supervision the collection has been installed. Its increase during the year has been greater than during any previous year except the first, when the nucleus of the collection was formed from the collections received from different national departments at the Centennial Exhibition, and by the gifts of W. H. Schiefflin & Co., of New York, which were remarkable for their interest and value.

Among the most important accessions received during the year, were those presented by the Governments of Jamaica, Japan, and Mexico; the collection of Dr. Edward Palmer, from the States and Territories of the Southwest; and the gifts of F. Stearns & Co., of Detroit, Mich., and W. S. Thompson, of Washington, D. C. The curator has devoted much time to completing his arrangement of the collection, and has carried on several important investigations on the physiological action of drugs. Seven original papers embodying the results of his investigations have been published and are given in the bibliography, and two more are in press; others are in progress. The exhibition series now contains 3,326 specimens, and nearly half of these are provided with printed labels. The whole collection now includes 4,850 specimens, and 409 entries have been added to the catalogue during the year. A descriptive catalogue is now in preparation.

There has been a constant improvement in the condition of the fisheries collection, which, since its inauguration in the east north range in 1884, has been under the curatorship of Mr. R. E. Earll. The nucleus for this collection was obtained from the Philadelphia Exhibition in 1876. The fisheries of North America are now so thoroughly represented that there can be but little necessity for extending this portion of the department, except by keeping it abreast of the time, by exhibiting modern improvements in apparatus, and the building up of certain special subjects rather of local importance, such as the Chinese fisheries of the Pacific coast. Important contributions have been received from the Government of Siam through Minister Haldeman, from the Government of Japan, and the collections from Great Britain, Sweden, Spain, France, Holland, and Greece, acquired at the close of the London Exhibition, in 1883, have been incorporated in the exhibition series. The necessity of more exhibition space is very apparent. The fish-cultural objects are almost entirely crowded out, and many of the objects are now hung against the wall at such a height as to render them, and the labels attached to them, at least partially invisible.

The collection of animal products is also under Mr. Earll's charge. The nucleus of this collection was obtained at the Philadelphia Exhibition in 1876, and was greatly extended by the addition of material presented from the New Orleans Exposition. There are now on exhibition nearly 1,600 specimens, illustrating the applications of the products of the animal kingdom in the arts and industries.

In the north hall of the Museum are displayed several hundred objects relating to the history of soldiers and statesmen, and a large num-

ber of relics of important events. Here are the Washington relics, transferred in 1883 from the Patent Office, and which include much that is interesting in connection with the domestic and field life of Washington. Among other relics may be mentioned the gifts of foreign Governments to President Jefferson, Commodore Perry, General Ripley, General Grant, and others; as well as memorials of many of the Arctic expeditions sent out by the United States and English Governments during the last forty years, including those in charge of Sir John Franklin, McClintock, Kane, Hall, and De Long. During the year a large number of objects illustrating the history of the Southern Confederacy have been contributed; and it is hoped that the collections to illustrate the participation of the North in the war of the Rebellion may be similarly increased.

The arrangement of a collection of coins and medals has been begun, and about 2,000 specimens have already been placed on exhibition. A series of medals illustrating the history of the United States, including bronze copies in duplicate of all the medals that have been struck at the Mint since its organization, has been deposited in the Museum by the Director of the Mint. The coin series is increasing, and progress has been made in classifying and labelling about 2,000 specimens of ancient Greek and Roman coins recently presented to the Museum, and of the numerous foreign medals at various times presented to the Smithsonian Institution.

A section devoted to the history of transportation was organized under the supervision of Mr. J. E. Watkins in 1885. The exhibit, which is at present small, includes the engine "John Bull" imported from England in 1833 for the Pennsylvania Railroad Company, and some objects illustrating the beginnings of the American railroad system. The report of Mr. Watkins presented in Part II, contains an exhaustive plan in connection with the development of this section, and it is hoped that it may be practicable to carry it out.

A collection of some two hundred and fifty scientific instruments, consisting for the most part of apparatus used by Priestley, Henry, and Hare, is temporarily exhibited in the north hall, as well as the original Morse telegraph instrument deposited by Stephen Vail.

There are included in this department a great many other collections which at present have no organized supervision, and to which additions are not at present specially sought for several reasons. Among these are the collections of musical instruments, modern pottery, and porcelain, lacquer, and the various processes used in the reproductive industries. It is expected that the lithographic and allied exhibits will be shortly developed.

Four large and valuable tapestries, depicting scenes in the life of Alexander the Great, and executed by Jan Leyniers, a celebrated Flemish weaver who was born in 1627 and died in 1686, have been deposited by General P. H. Sheridan.

DEPARTMENT OF ETHNOLOGY.

Prof. Otis T. Mason, curator of Ethnology, has been constantly engaged in the preliminary classification of the immense collections of material under his charge, with special reference to their final installation, devoting his attention chiefly to certain classes of objects, such as weapons of war and the chase, implements of agriculture, and other primitive industries. In addition to these great series classified according to function, other groups of objects have been arranged with reference to ethnical considerations.

In the classification of the numerous groups of objects in this department, such as basket work, throwing-sticks, sinew-back bows, archery, transportation, and the several handicrafts of the various tribes of Indians, an effort is being made to introduce the strict methods of classification and nomenclature which are already applied in the other departments of natural science.

The Eskimo collection has been arranged in table cases in one of the exhibition halls in accordance with the ethnic idea, although in the minor details of classification function and form as well as geographical distribution have been followed.

In November, 1885, Lieut. T. Dix Bolles, U. S. Navy, having been detailed for service in the National Museum by the Secretary of the Navy, was assigned to duty in this department.

The number of specimens in this department is estimated by the curator at 500,000. During the year 1,344 entries were made in the catalogues.

The interest of this department is constantly increasing under its present energetic management, and its value to visitors has been greatly enhanced by the extension of the system of descriptive labels.

SECTION OF ABORIGINAL AMERICAN POTTERY.

The accessions to this section during the past year have been numerous and very important, especially those received from the Bureau of Ethnology. The material belonging to this department, together with the collections of South American aboriginal pottery, and of the extensive collections from the mounds, which have for many years been accumulating in the archæological hall of the Smithsonian building, and have now been transferred to the custody of this department, have completely filled the northwest court.

A special feature of this exhibition hall is the case, 260 feet long and 4 feet 8 inches deep. This is in two compartments throughout, that in the rear being used for the storage of the duplicate and unassorted collection of American pottery.

The value of these collections is practically inestimable, since even the modern tribes, who are still making pottery similar in its general character to that which is here preserved, have deteriorated to such a

degree in their artistic capacity or skill, that their products are not therefore an exponent of their original artistic capabilities. So exhaustive and monographic is this collection that any thorough study of American aboriginal pottery must of necessity in great part be based upon this collection.

In addition to his administrative work, Mr. Holmes, the curator, has been engaged in the preparation of a monograph of a number of collections from the Province of Chiriqui, in Colombia, and in investigating the influence of textile decoration upon the ornamentation of pottery.

The collections made under the direction of the Bureau of Ethnology in the Mississippi Valley by Dr. Cyrus Thomas are deserving of special mention, as well as those of Col. James Stevenson and Mr. E. W. Nelson in the Pueblo country of the Southwest.

The number of specimens in the collection is estimated at 25,000, and during the year 3,234 entries were made in the catalogues.

DEPARTMENT OF PREHISTORIC ANTHROPOLOGY.

The system of classification in this department is (1) by material, all objects of stone being placed together, as also of copper, shell, horn, clay, bone, and wood; (2) by form and function, thus, stone pestles, arrow-heads, knives etc., are placed together; (3) by development, in order to show the gradual progression from the crudest to the most perfect form.

The total number of accessions has been 2,751, and the more important of these are treated of on a geographical basis in the report on this department.

The reserve series includes more than 40,000 specimens.

In addition to the general collection, there is a special or "local" collection, in which sets of objects obtained from separate localities, such as a single grave, mound, or village site, are installed together.

During the year one hundred and nineteen of these special collections have been placed on exhibition. This form of special collection is becoming of great importance in the department.

Through the co-operation of the Bureau of Ethnology a large amount of valuable material has been obtained from West Virginia, Alabama, Mississippi, Ohio, Illinois, Tennessee, Wisconsin, and Arkansas.

Dr. Rau is engaged upon the preparation of an illustrated work on North American pre-historic relics, which is designed to serve as a guide for visitors to the department, and as an explanation of the terminology of North American archæology. This will bear the title "A Classification of the North American Pre-historic Relics in the U. S. National Museum."

No less than 3,667 specimens have been added to the exhibition and study series during the year, making a total of 40,281 specimens in this series. The duplicate collection numbers nearly 9,000 specimens. During the year 647 catalogue entries were made,

DIVISION OF ZOOLOGY.

DEPARTMENT OF MAMMALS.

The administrative work of the department has been directed mainly to the preparation for an entire re-arrangement of the exhibition series. Twenty new specimens have been placed on exhibition during the year. There have been made 407 entries in the catalogue of the department, the majority of the accessions having been received from the Central Park Menagerie, in New York City, the Zoological Gardens at Philadelphia, and Barnum's Menagerie.

The entire collection, with the exception of the shrew-mole (*Soricidæ*), has been studied and identified, and a card catalogue of the skins and alcoholic specimens, which now amount to 7,451, has been completed. A report was prepared during the year upon the mammals collected by E. W. Nelson and C. L. McKay in Alaska. Mr. F. W. True, curator, has in progress extensive investigations on American cetaceans, and is at present engaged upon a revision of the dolphins. During the year Mr. True visited various points on the coast of North Carolina, to study the dolphin and porpoise fisheries. He has continued his studies upon the toothed whales, and in connection with the comparison of skulls of the American species of lynx discovered cranial differences between *Lynx canadensis* and *Lynx rufus*. He has also made a new study of the kangaroo rats.

In the spring of 1886 Mr. William T. Hornaday, chief taxidermist, was sent by the Smithsonian Institution to Montana for the purpose of obtaining skins and skeletons of buffalo, now on the verge of extinction.

DEPARTMENT OF BIRDS.

An important part of the administrative work of this department has been the extension of the collections by means of exchange. Two thousand five hundred and eighty-one specimens have been sent out through exchange, and a full equivalent has been received. Altogether 4,147 specimens have been added to the collection during the year, the largest contribution having been made by the Fish Commission steamer *Albatross*, in the Bahamas, consisting of 1,000 specimens and about 75 species, 5 of which were new to science. Exchanges have been completed with the Musée d'Histoire Naturelle, in Paris, representing 86 specimens, 79 species, from Madagascar and Cochin China; with the British Museum, 235 specimens, 179 species, from India and Europe; with the Mexican Geographical Exploring Expedition, 135 specimens, 75 species; and with Count Haus von Berlepsch, of Münden, Germany, 60 specimens, 50 species, of South American birds.

More than half of the mounted collection has been transferred to exhibition stands of the improved standard recently adopted. The final labelling of the exhibition series has been deferred by delays at the Government Printing Office, and advantage has been taken of the delay to revise the labels in order that they may accord with the order of

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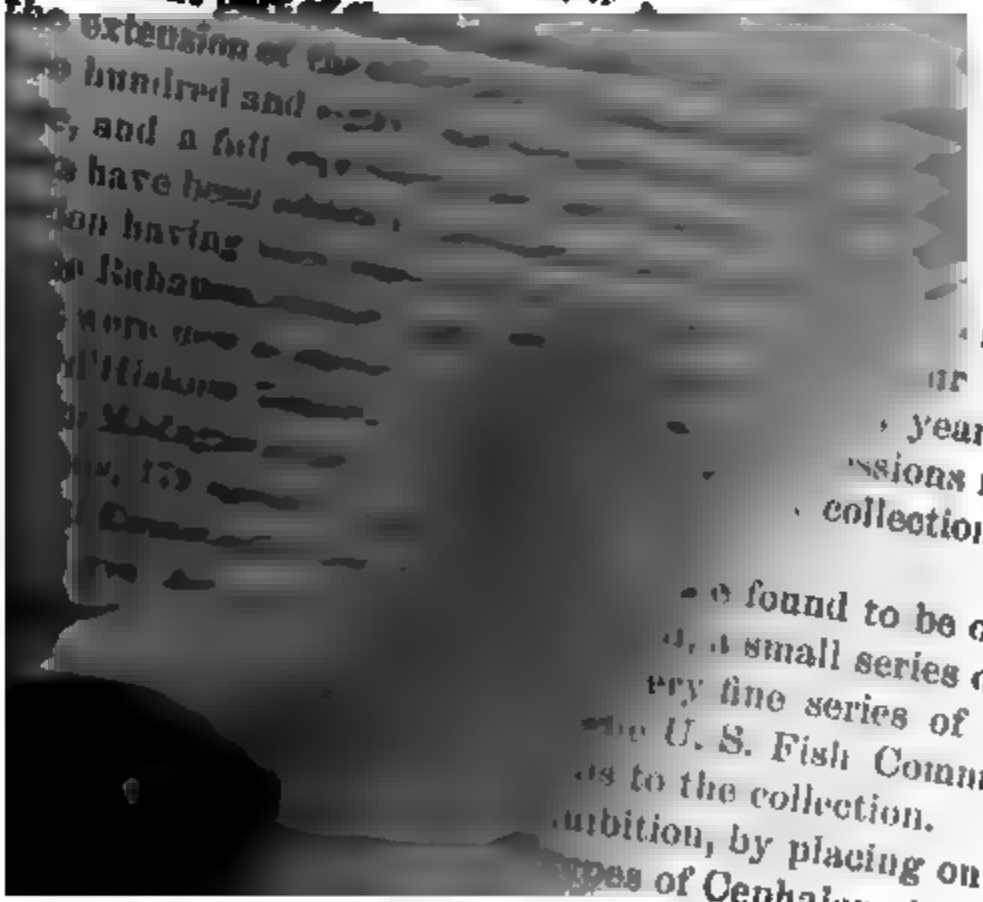

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classification adopted by the American Ornithologists' Union, which is described in the report of the curator, Mr. Ridgway.

Many important groups have been received for special critical revision, notably the various Procellarian genera *Æstrelata* and *Puffinus*, and the genera *Collinus*, *Larus*, *Lagopus*, and *Empidonax*. Dr. Stejneger has continued his revisions of Japanese ornithology.

An important research completed during the year was that upon the birds of Mexico, made by Professor Ferrari-Perez, of the Geographical Exploring Expedition of Mexico, who brought to Washington for the purpose the entire collection of birds in the National Museum of Mexico. Professor Ferrari-Perez's report was based upon the studies of the two national collections, and has been published in the Proceedings of the National Museum.*

There are now 55,945 specimens in the collection, of which 7,000 have been set apart for exhibition. The exhibition series might advantageously be made to include 15,000 specimens if space permitted

SECTION OF BIRDS' EGGS.

Much has been accomplished during the year by Capt. C. E. Bendire, U. S. Army, honorary curator, in the classification and arrangement of the collection of eggs and nests. The collection includes about 44,000 specimens, of which 1,491 are on exhibition, 31,124 are in the reserve series, and 11,548 are duplicate. More than 2,550 additions, in 253 lots, have been made during the year. It is to be hoped that before long it may be possible to give more space to this crowded collection. Captain Bendire has, as heretofore, made generous contributions from his private collection.

DEPARTMENT OF REPTILES AND BATRACHIANS.

The collections in this department are very inadequately provided with space, either for reserve or exhibition purposes. The collection, still under the honorary curatorship of Dr. H. C. Yarrow, U. S. Army, includes about 25,350 specimens, which represent nearly every species of North American reptiles and batrachians.

Prof. E. D. Cope has in preparation, under the direction of the Smithsonian Institution, a report on the reptiles of North America, and has made a large number of identifications and descriptions. He has also completed his report on the Batrachia of North America, and identified all the undetermined batrachians in the collection.

During the year 444 entries, including 1,705 specimens, were made in the catalogue of the department.

DEPARTMENT OF FISHES.

The curator, Dr. T. H. Bean, has re-examined the entire collection, now including some 75,000 specimens. No less than twenty-five barrels of alcohol were used in refilling the bottles and replacing the old alcohol.

* Vol. IX, pp. 125–199.

Nearly 15,000 specimens have been set aside for arrangement into sets for distribution and exchange. During the year, 662 entries have been made in the catalogue, bringing the total number of entries up to 37,893.

Much of the curator's time has been consumed by his work as editor of the Proceedings and Bulletins, and during the year Bulletins 23, 28, 29, 30, and 31, were sent to press under his editorial supervision.

The customary amount of special research has been carried on, and several reports upon special collections have been made. Considerable time has been devoted by Dr. Bean and myself to the preparation of a report upon the extensive deep-sea collections of the U. S. Fish Commission, and those obtained by Mr. Alexander Agassiz in connection with the work of the U. S. Coast Survey.

The work of this department was, during the months of August and September, 1885, transferred to the Fish Commission headquarters at Wood's Holl, where all of the deep-sea collections were concentrated, overhauled, classified, and catalogued, and a considerable amount of systematic investigation carried on, a portion of the results of which have already been made public, and the remainder, it is hoped, will soon appear in a monograph of the deep-sea fish fauna of the Eastern Atlantic, now for some years in preparation.

The ease with which this extensive collection was handled in the large rooms which were available for the purpose at Wood's Holl, offers an illustration of the great need for the better accommodation of the fish collection in Washington. Work was finished in a few weeks at Wood's Holl which would have occupied four or five months in the cramped work-rooms in the Museum.

DEPARTMENT OF MOLLUSKS (INCLUDING CENOZOIC INVERTEBRATE FOSSILS).

Under the curatorship of Mr. W. H. Dall, the department of mollusks has made extensive progress during the year, especially in the matter of cataloguing and arranging material which has accumulated in past years. The number of catalogue entries was 18,638, representing between fifty and sixty thousand specimens. Only about four times as many entries had been made during the preceding twenty years.

The classification and systematic arrangement of accessions received in previous years, especially the Jeffries and Stearns collections, have received special attention.

Among the named species received, which were found to be of more than ordinary interest, were 71 from Bering Sea, a small series of land and fresh-water shells from Manitoba, and a very fine series of Madagascar land shells. As in previous years, the U. S. Fish Commission made by far the most important contributions to the collection.

A beginning has been made in public exhibition, by placing on view an experimental case containing the chief types of Cephalopods, pearls

and pearl formations, cameo shells, and sections showing the internal structure of various large and ornamental species. A provisional display of the principal economic mollusks of North America has also been made. Under the supervision of Dr. R. E. C. Stearns, adjunct curator, an exhibit of the edible mollusks from the Atlantic and Pacific, of ornamental species from tropical seas, and of land and fresh-water species, has been installed. There is no room at present for the exhibition of the general collection.

The work of the curator and his assistants has consisted chiefly in the identification of specimens for teachers and others in various parts of the United States; the identification and classification of the recent or living mollusks of the Atlantic coast of North America, as well as those of the Antillean-Caribbean region; and the arrangement of land, pond, and fluviatile gastropods, as well as the fresh-water Acephala, for the purposes of comparison and investigation in the matter of geographical distribution and variation of species as related to and affected by environmental conditions.

Among the most important investigations in progress is that of Mr. Dall upon the deep-sea mollusks and his studies upon the Quaternary molluscan fauna of the United States; and the continuation of previous investigations by Dr. Stearns on the geographical distribution of the land and fresh-water mollusks of North America and the variation of the same, as related to and affected by the physical characters of their environment.

DEPARTMENT OF INSECTS.

This department was organized three years ago, but little has hitherto been attempted beyond the preservation of the collections; Dr. C. V. Riley, the honorary curator, having been without an aid. An assistant curatorship, to which Mr. John B. Smith has been appointed, was established at the beginning of this year, and additional accommodations in the laboratory and exhibition hall have been provided, thus permitting an important extension of the study and exhibition series.

In October Dr. C. V. Riley formally presented to the Museum his extensive private collection of North American insects, containing over 115,000 pinned specimens, representing over 20,000 species. This collection is the result of his labors in collecting and study for more than twenty-five years.

It is estimated that there are now at least 500,000 specimens in the collection.

The following table shows the estimated numbers of the pinned and mounted specimens in the collection:

	Boxes.	Specimens.	Species.
Hymenoptera	66	24,796	2,650
Coleoptera	127	43,613	6,558
Lepidoptera	338	17,098	2,308
Diptera	21	5,646	699
Hemiptera	59	8,862	1,184
Orthoptera	64	6,903	560
Neuroptera	14	868	169
Arachnida and Myriapoda	2	425	110
Insect architecture	16	1,080	178
Miscellaneous (not yet arranged)	28	1,610	178
Galls and gall insects	31	4,152	734
Total	766	115,053	15,328

In addition to these pinned specimens, the collection contains some nineteen large boxes of alcoholic material, chiefly of the adolescent states of insects, comprising some 2,850 vials, in many cases several species being contained in a single vial. The collection contains a large number of undescribed species in all orders.

The early states of the minuter insects are mounted in balsam on slides (1 by 3 inches), of which the collection contains upward of 3,000, most of the slides holding the contents of three cover glasses.

The mounted material is contained for the most part in double-folding boxes in book form, about 32 by 22 by 8 centimeters, lined on both sides with cork and paper.

A certain proportion of the boxes are less than 7 centimeters wide, and are lined only on one side. There are also two cabinets, one with sixteen large, glass-covered drawers, and another (now at Dr. Riley's residence) of sixty glass-covered drawers. The specimens are all duly classified and labeled, and in excellent order and preservation. The labels include notes as to locality and food habit, and are also in many cases numbered to correspond to detailed notes as to adolescent states and habits.

The collection was begun twenty-five years ago, and represents Dr. Riley's continuous collectings since, including his own types and many of other authors received in exchange. It embraces few exotic species, and is more particularly rich in biological material, containing more blown and alcoholic larvæ and pupæ in connection with their imagos than perhaps any other collection of North American insects. Including the unarranged and alcoholic material not connected with the pinned specimens, there are over 20,000 species in the collection.

The curator has continued his work in re-arranging and perfecting different families in several orders, particularly among the micro-lepidoptera.

DEPARTMENT OF MARINE INVERTEBRATES.

By far the largest part of the material received by this department was obtained by the U. S. Fish Commission steamer *Albatross*, while engaged in making extensive explorations along the entire eastern coast of North America from the Grand Bank of Newfoundland to southern Florida and the Bahamas. The results of this exploration were of great value, since a large part of the region visited had never been systematically investigated before. Over two hundred and fifty successful hauls were made with the dredge and the trawl-net. Among important donations from other sources were a fine series of deep-sea soundings from the Southern Atlantic and Pacific Oceans, made by the U. S. steamer *Enterprise*, and large collections from the western and northwestern coasts of America and Siberia. A most interesting series of microscopical preparations of nearly two hundred species of British sponges, mainly described or identified by Dr. Bowerbank, was supplied by the Rev. A. M. Norman, a distinguished English naturalist.

The collection of Echini, or Sea Urchins, has now been completely identified and arranged for reference and study. Of this group the Museum possesses 152 species, many of which are represented by extensive series of specimens covering a wide range of distribution.

The curator has continued his studies of the parasitic copepoda of the Atlantic coast. He has also revised the collection of star-fishes, and thoroughly overhauled the species collected by the U. S. Fish Commission on the Atlantic coast north of Cape Hatteras.

Work upon the collection of Ophiurans has been continued by the Hon. Theodore Lyman, who is at present engaged in studying the material obtained by the *Albatross* south of Cape Hatteras, and that from the western coast of North America, including Alaska.

The number of catalogue entries during the year has been 7,074, a single entry often representing hundreds of specimens. The total number of specimens at present in the collection is estimated at 350,000.

DEPARTMENT OF COMPARATIVE ANATOMY.

The development of the osteological collection has been the chief work undertaken by the acting curator, Mr. True.

Mr. Lucas has rendered most efficient service in the development and arrangement of the collection. It has been the desire of the curator, to obtain a series of skeletons of thoroughbred domestic animals, and several specimens representing the important breeds of dogs have been obtained.

The number of catalogue entries during the year, embracing birds, mammals, fishes, reptiles, and batrachians, was 1,017. The total number of specimens in the collection is now 10,210. A card catalogue of the skeletons of the mammals has been completed.

DEPARTMENT OF INVERTEBRATE FOSSILS (Paleozoic).

This department is under the charge of Mr. C. D. Walcott, of the U. S. Geological Survey. The collection now includes over 80,000 specimens, of which perhaps one-third has been transferred by the U. S. Geological Survey to the Museum. During his connection with the Museum Mr. Walcott has thoroughly arranged this material. A very interesting series has been selected for exhibition, although up to the present time it has been impracticable to place any material upon view.

The curator has been engaged in a special research, in behalf of the U. S. Geological Survey, upon the stratigraphy and palæontology of the Cambrian system of North America.

Prior to the year 1884 the increase in the material of this department had been irregular, owing to the lack of time and means at the disposal of the curator; during that year, however, Mr. Walcott introduced a thorough system of classification, and began the formation of a systematic collection of Cambrian fossils.

DEPARTMENT OF INVERTEBRATE FOSSILS (Mesozoic).

The principal accessions to the collection have been those received from the U. S. Geological Survey. The curator, Dr. C. A. White, reports that a total number of 1,563 entries were made in the catalogue during the year. Among the accessions of special interest was a collection of Cretaceous fossils from Mexico, and another of Lower Cretaceous and Jurassic from France. The total number of specimens in the collection at present is 69,742.

Steady progress has been made in the work of arrangement and classification; and the collection is now accessible for purposes of study. The provisional arrangement which has been adopted, is purely stratigraphical; though a broad biological classification under each geological period has been attempted. Mr. J. B. Marcou has re-identified all the type specimens, and has published a catalogue of these in the Proceedings of the Museum.*

DEPARTMENT OF INVERTEBRATE FOSSILS (Cenozoic.)

Since the transfer of Mr. W. H. Dall from the Coast Survey to the U. S. Geological Survey, in which he is now serving as palæontologist in charge of the later formations, this department has been organized. It is, however, really inseparable from the department of mollusks, of which Mr. Dall has long been curator.

DIVISION OF BOTANY.

DEPARTMENT OF FOSSIL AND RECENT PLANTS.

The attention of the curator of these two departments, Prof. Lester F. Ward, of the Geological Survey, has been directed chiefly toward the study of the fossil plants: his sketch of the history and present

* Proc. U. S. Nat. Mus., VIII, 1885, pp. 290–344.

condition of fossil botany, published in the Fifth Annual Report of the Director of the Geological Survey, gives an excellent idea of the character of the work which he has undertaken to accomplish in connection with the National Museum collections.

The work of classification and arrangement has progressed, and the herbarium of recent plants is now estimated at not less than 30,000 specimens: while that of fossil plants includes 7,439 specimens.

Dr. F. V. Havard contributed large and valuable collections of plants from Texas and the adjacent States and Territories, containing the types of his report on the "Flora of Western and Southern Texas," published in the Proceedings of the National Museum.*

A card catalogue of the Joad collection of plants from the Old World, recently acquired from the Royal Botanical Garden at Kew, has been completed. This collection contains over 10,000 species, 9,000 of which were new to the Museum.

DIVISION OF GEOLOGY.

DEPARTMENT OF MINERALS.

Under the direction of Prof. F. W. Clarke, the department of minerals is now making rapid progress. During the year exchanges have been carried on with private collectors and with a number of public museums, among which may be mentioned the École des Mines, at Paris; the Musée d'Annecy, in Savoy; the University of Sydney, Australia; and that of Amherst College. The total number of specimens received during the year was 800.

Nearly 4,500 of the 18,401 specimens constituting the collection of the Museum, are now on exhibition. Especial attention has been devoted to the development of the collection of gems and ornamental stones.

In connection with his official duties as chemist of the Geological Survey, the curator has been enabled to accomplish much scientific work upon the Museum collections. He has made a study of the minerals received from Litchfield, Me., and the turquoise from New Mexico, and is at present investigating the chemical structure of the silicates and preparing a revision of the borates, and is also making a full series of analyses of tourmaline.

DEPARTMENT OF LITHOLOGY AND PHYSICAL GEOLOGY.

Although the increase of material in this department has not been very great, during the year the number of catalogue entries has been 1,021.

The exhibition series has increased, and all the available cases are now filled. Much attention has been devoted to the preparation of the exhibition series and accompanying labels and to the completion of the study series.

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* Proc. U. S. Nat. Mus., VIII, 1885, pp. 449–533.

Among the more important accessions have been several relief maps received from the Geological Survey, a collection of rocks and building stones from Mexico, a series of the rocks of Continental Europe, and a series of typical marbles and building stones from South Carolina, etc.

There are several groups of exhibition specimens in process of preparation, among them being a structural series, a lithological series, and a series of building and ornamental stones. These are in part on exhibition, though not in their proper places in the systematic collection.

The curator, Mr. Merrill, is engaged in investigations upon the mineralogy of the District of Columbia, the origin and nature of fulgurites, and the durability of building stones, besides carrying on studies on local petrography; and has just completed a catalogue of the collection of building stones now in the Museum.

The total number of specimens in the collection is estimated at 20,647, of which 17,647 belong to the reserve series. Of the latter number 5,313 are on exhibition, 2,730 being specimens of building and ornamental stones, and 1,829 belonging to the educational series of rocks and rock-forming minerals. There are, also, in the collection 3,400 thin sections of rocks prepared for microscopic study. Of these nearly 200 have been added during the year.

DEPARTMENT OF METALLURGY AND ECONOMIC GEOLOGY.

Owing to the fact that so great a mass of material is already assigned this department, which is under the curatorship of Mr. F. P. Dewey, it has not been considered wise to solicit additional collections, although much has been received during the year.

The special attention of the curator has been given to the arrangement and classification of the mass of material received from the Institute of Mining Engineers, part of which arrived during this year.

The preparation of the exhibition series has been going steadily forward, and a portion has been placed on exhibition as a preliminary display. The curator has commenced the preparation of a descriptive catalogue of the systematic collections, to serve as a guide to visitors.

For three years past the curator has been employed in an investigation of the physical properties of coke, and has published a paper upon the porosity and specific gravity of different kinds of this material.

The total number of specimens in the collection is estimated at 48,000, of which 17,000 are on exhibition. During the year 5,506 entries were made, including 8,552 specimens.

D.—REVIEW OF THE ADMINISTRATIVE WORK OF THE YEAR.

It will be evident from what has already been said that marked progress has been made in the arrangement and identification of the material in the custody of the staff curators. At no time in the history of the Museum has classification and installation received so much attention. For the past five years the Museum staff has been overburdened with the preparation of exhibits for Berlin, London, New Orleans, Louisville, and Cincinnati, and although much valuable material, which would otherwise have been lost to the Museum, has been obtained, it is equally true that during those years the progress of the Museum work proper has been necessarily made subservient, and has been seriously impeded.

The reports of the curators indicate that better progress has been made in the development of the exhibition series in the past than in any previous year. The systematic arrangement of many of the collections has been commenced, and although much yet remains to be done in the installation and labelling of specimens, the general appearance of the public halls is far more satisfactory than ever before. In the three geological departments this advance is especially manifest; as well as in that of comparative anatomy.

The Museum may well be congratulated upon this progress, for there is no reason to doubt that the systematic arrangement of all the collections will, during the next fiscal year, make still greater headway.

The advance of the work has given an opportunity for much experience in methods of installation and labelling, and the principles of administration which have been tentatively laid down in previous reports have been brought still further into experimental practice. It is still the belief of our administrators that there are certain cardinal principles which must be considered in the arrangement of collections in public museums. Each object should illustrate an *idea*, and no two objects should be shown, which illustrate the same idea in a similar manner. Further than this, the idea to be illustrated should be explained on the label in such a manner that any intelligent visitor, without previous special knowledge of the subject, may be able to learn why the object is shown and what lesson it is intended to teach. The objects, also, should be so carefully classified that their relations to each other may be recognized by the visitor, so that, taken together, they suggest certain general conclusions; and in arriving at them the visitor should be aided by certain general or collective labels, which should be supplemented, where practicable, by guide-books and manuals containing all the information upon the labels, arranged systematically and illustrated by engravings of the more important objects.

The study series includes those specimens which are not placed upon exhibition, but are retained in the laboratories or stored in the unit tables

in the exhibition halls. This series is kept for purposes of comparison and study, or as a basis for the preparation of monographic treatises. Numerous applications have been received for the loan of specimens in the Museum, constituting types of the species, and as on several occasions in previous years type specimens have been lost or otherwise destroyed whilst in the hands of the borrower, it has been found absolutely necessary to impose very strict limitations upon the sending away of type specimens. Free access is allowed to specialists in the examination of these specimens in the laboratories, but no type specimens are now sent to individuals. Formal applications by the authorities of other museums are always, when possible, favorably responded to. In this connection a circular (No. 35) has recently been issued. It reads:

> *Type specimens will in future not be sent out of the National Museum for purposes of study, except to officers of scientific institutions or societies who shall charge themselves with the responsibility of their safekeeping and return.*

This action on the part of the Museum is in no way intended to act as an obstacle to those engaged in scientific pursuits, but is a necessary step in order to insure the finding of any given types when desired for study.

1. PROGRESS OF GENERAL AND INCIDENTAL WORK.

LIBRARY.

The work of the library has been carried on without any important changes from the methods employed in the previous year: it is, however, becoming yearly more serviceable to the scientific staff of the Muuseum, as is shown by the fact that the number of books borrowed during the year is greater than ever before.

The total number of books and pamphlets received during the year was 2,424 (exclusive of regular periodicals). Of these, 1,372, or more than one-half, were books selected from the extensive accessions of the Smithsonian Institution to be retained at this library, while the rest were sent to the Library of Congress.

As usual, the chief contributor has been Professor Spencer F. Baird, to whom the library is indebted for 37 volumes, 192 pamphlets, and 2 maps.

Another important gift was that of Mr. J. C. Brevoort, of New York, which consisted of 16 volumes and 144 pamphlets, almost entirely on ichthyological subjects, and many of them of great value. Among other contributions the most important are those from Mr. Robert Ridgway, U. S. National Museum, 52 pamphlets; the Smithsonian Institution, 5 volumes, 25 pamphlets; the Royal Swedish Academy of Sciences, 10 volumes, 20 pamphlets; and the U. S. Geological Survey, 9 volumes and 2 pamphlets.

The periodical department of the library contains more or less complete sets of 570 periodicals, chiefly the proceedings of learned societies

and scientific serials. A systematic effort is being made with the co-operation of the Smithsonian Institution to fill up incomplete files and add new periodicals by means of exchange.

A slight change has been made in the method of keeping the record of books lent and returned. The "ledger by borrowers" has been discontinued, and, in place of it, the receipts or "call-cards," signed by the borrowers, are carefully filed, thus serving to show what books each borrower has in his possession. On the return of a book, the card is returned to the borrower, and the entry on the "ledger of books issued" is cancelled. This plan has been found more efficacious than the old system, since by substituting two entries for three, one possible source of error is eliminated. The number of books borrowed during the year was 3,867.

The card catalogue, by authors, has been continued as in previous years. The total number of books catalogued during the year was 2,923, of which 553 were volumes of more than one hundred pages, and the remainder pamphlets.

The library is especially rich in scientific pamphlets, particularly authors' "extras" of their publications in scientific periodicals; and it is particularly important that this collection should be extended.

The work of putting the pamphlets into covers was begun in March; and at the end of the year, 1,706 pamphlets had been thus bound.

The library is still in great need of money for the purchase of the latest editions of books of reference. Its most pressing necessity, however, is more room for the large and constantly increasing number of periodicals.

Exchanges and Distribution of Duplicates.

The customary distribution of duplicate specimens has been continued during the year. The importance of this work was well characterized by Professor Baird in his report to the Secretary of the Institution in 1861: "When it is considered that all these [specimens] have been named and labelled by naturalists admitted to be of the highest authority in their respective departments, and that all have thereby the character and value of types, many of them belonging to species first described from Smithsonian specimens, or serving as the materials of elaborate monographs, it will be readily understood how much their systematic and judicious distribution by the Institution all over the world must conduce to the advancement of science."

The extent of the work is shown by the table here presented. Of the 118 distributions included in the table, 41 were to foreign institutions and individuals.

Table showing the nature of duplicate material distributed between July, 1885, and July, 1886.

Objects.	Species.	Specimens.
Fishes	14	26
Pottery	.....	626
Fossils	.....	42
Mollusks	295	759
Ethnology	.....	1,453
Archæology	.....	241
Minerals	318	1,862
Marine invertebrates, 32 sets	200	18,000
Miscellaneous	61	260
Plants	.....	49
Rocks	145	221
Mammals	61	98
Casts of fishes	12	12
Reptiles	7	7
Textiles	.....	331
Total number of specimens	.....	23,987

The number of applications for drawings and photographs of the standard styles of cases used in the Museum, which have been favorably acted upon during the year, has been 115. In addition, 57 sample cases and drawers have been lent to colleges and other institutions desirous of examining their construction, with a view to adopting similar forms in their own museums and laboratories.

The Mexican Geographical and Exploring Commission, from which were received valuable collections of birds and other natural history objects, requested to be supplied with a full series of papers, working-drawings, etc., in connection with the operations of the Museum. In response to this request, a box was forwarded, containing thirteen cyanotypes of working-drawings of Museum cases, sixteen photographs of cases, a complete set of blanks and circulars used in the administration of the Museum, together with a set of Museum circulars and plans of the Museum buildings. The Smithsonian Institution and U. S. Fish Commission also sent specimens of blanks and circulars.

The preparation of a set of casts of fishes and reptiles for the American Museum of Natural History, in New York, was commenced and partially completed during the year.

In October, 1885, the preparation of a duplicate collection of building-stones for the museum above referred to, was completed. This task was undertaken in continuation of an engagement entered into between the American Museum of Natural History and the late Dr. George W. Hawes, while in charge of the collection of building-stones in the Museum and of the work of gathering material for the Tenth Census.

Foreign exchanges.—Exchanges have been made with several foreign museums and institutions. Nine mammal skins have been received from

the Australian Museum, Sydney. An extensive exchange of ethnological material is being arranged with the ethnological department of the Royal Museum of Berlin. Negotiations for an exchange of mammals, birds and insects with the Musée d'Histoire Naturelle, Paris, are in progress. Thirty-five species of Jamaican fishes have been received from the Public Museum of the Institute of Jamaica. From the Canadian Geological Survey have been received 67 species of Cambrian fossils; and skeletons of *Python molurus* and *Cercopithecus rufo-viridis*, a specimen of *Pentacrinus* and a set of marine invertebrates have been sent in exchange. M. Charpy,* director of the Musée d'Annecy, Annecy, Haute-Savoie, France, has sent four boxes of minerals, rocks, fossils, and shells, etc., and an equivalent in Ohio and Cincinnati Silurian fossils has been promised in exchange. The museum has sent to the Auckland Museum, New Zealand, large collections of ethnological material, bird-skins, ores, and minerals, and has received in exchange 104 specimens of New Zealand bird-skins. An offer of ethnological material has been made to Mr. S. H. Drew, of Wanganui, New Zealand, in exchange for marine invertebrates, fresh-water shells and fossils. From the École des Mines, Paris, has been received a collection of French minerals, in exchange for which 71 specimens of United States minerals have been sent. Dr. Julius von Haast, director of the Canterbury Museum, Christ Church, New Zealand, has sent 7 fine specimens of nephrite, and has received a set of marine invertebrates. Dr. von Haast has promised to collect skeletons of whales and seals for the National Museum, and has offered a series of New Zealand timbers, for which ethnological material has been promised. Extensive exchanges have been conducted with several of the musées under the direction of the Ministère de l'Instruction Publique, Paris. Six boxes of ethnological material were sent in August, 1885, and a number of casts of Indian heads in March, 1886, to the Trocadéro Museum. The Minister of Public Instruction has recently announced the transmission of 9 vases, from the Manufacture Nationale de Sèvres, 8 pieces of tapestry from the Manufacture Nationale des Gobelins, and some specimens of tapestry work from the Manufacture Nationale de Beauvais. An exchange of birds, fishes, and shells is being arranged with the Imperial Zoological Museum of the Academy of Sciences, St. Petersburg, Russia. Negotiations are pending with Dr. F. R. Jentink, director of the National Museum of Natural History, Leiden, Holland, for an exchange of mammals from the East Indies and Africa, for American birds, reptiles, fishes, and marine invertebrates. Collections of mammal skins and skulls, materia medica, and reptiles have at various times been received from the Kurrachee Municipal Library and Museum (James A. Murray, curator), in exchange for which 390† specimens of birds and 24 mammals have been sent.

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* Deceased.

† Two hundred and seventy-eight of these were transmitted in 1881.

Bird skins have been exchanged with M. Milne Edwards,* of the Musée d'Histoire Naturelle, Paris.

Dr. T. Jeffrey Parker, Otago University Museum, Dunedin, New Zealand, has offered fishes, and desires American species in return. Negotiations are pending for an exchange of ethnological material with Signor L. Pigorini, director Museo Preistorico-Etnografico, Rome, Italy. A series of textile fabrics (manufactured and raw) has been sent to Count Ito, minister of the Imperial household department, Tokyo, Japan, for the Japanese Government. Four boxes of Japanese porcelains have been received from the Educational Department in Tokyo. An exchange of mammal skins has been effected with Prof. Tycho Tullberg, Upsala, Sweden, and an offer of birds and marine invertebrates in return for similar material has been made by the National Museum.

Seventeen mammal skins have been received from Dr. C. W. de Vis, director of the Queensland Museum, Brisbane, Australia. Specimens in exchange are being prepared for shipment. Dr. de Vis also offers a fœtus and skeleton of dugong in exchange for a manatee. This offer is now under consideration. Mr. L. Wray, jr., curator of the Perak Government Museum, Perak, Straits Settlements, has offered to present mammals, and to exchange tin-sand and wash-dirt from Perak tin-mines for mineralogical or geological specimens from the United States.

Extensive exchanges have been arranged with Prof. Fernando Ferrari Perez, of the Mexican Geographical and Exploring Expedition.

PUBLICATIONS.

The eighth volume of the Proceedings has not yet appeared, although the last signature is dated December 7, 1885. A list of the signatures of this volume is given in Part IV of this report.

During the year Bulletins 23, 28, 29 and 30 were issued, and are briefly reviewed here.

Bulletin 23 forms Part II of "Bibliographies of American Naturalists," and is entitled PUBLISHED WRITINGS OF ISAAC LEA, LL. D., by Newton Pratt Scudder, 8vo., pp. lix + 278. The list of writings is preceded by a biographical sketch. The bibliography is arranged chronologically. A list of genera and species, discussed and described, is arranged alphabetically; in addition there is a general index.

The collections of the National Museum were largely increased by gifts from Dr. Lea's collections, and his writings are based, in large part, upon this and other material belonging to the National Museum.

Bulletin 28. A MANUAL OF NORTH AMERICAN LAND SHELLS, by W. G. Binney, 8vo., pp. 528.

This bulletin is an enlarged edition of a work entitled "The land and Freshwater Shells of North America, Part I," published by the Smith-

* Before completion of this exchange M. Milne Edwards died, and the negotiations were continued with M. Oustalet.

sonian Institution in 1869. More attention is given in the present work to the subjects of geographical distribution, organs of generation, lingual dentition, and classification; and species are grouped geographically.

Bulletin 29. "RESULTS OF ORNITHOLOGICAL EXPLORATIONS IN THE COMMANDER ISLANDS AND IN KAMTSCHATKA," by Leonhard Stejneger; 8 vo., p. 382; 8 colored plates and map.

This work is the result of the author's explorations in the Commander Islands and in Kamtschatka, and contains the conclusions at which he has arrived after careful examination of the avifauna of that region, his investigations being based both upon material observed and collected by himself, and also upon specimens in the collection of the National Museum. This bulletin consists of three sections: (1) A review of the species of birds collected or observed by the author at the Commander Islands, and at Petropaulski, Kamtschatka; (2) a synopsis of the birds reported to inhabit Kamtschatka; and (3) conclusions.

The first section, which occupies the larger portion of the work, contains one hundred and forty descriptions and numerous tables. Besides technical descriptions there are references to the habits of the birds, and a few illustrations.

The second section, a synopsis of the birds reported to inhabit Kamtschatka, contains a list of one hundred and eighty-six species, an attempt being made to enumerate all the species which have been recorded from that place. A few names of species accredited to Kamtschatka without any reliable authority for the statements, are also included.

The chief sources from which knowledge of the Kamtschatkan ornis is derived, are the explorations of Steller, Vossnessenski, von Kittlitz, and Dybowski; and the author has based some of his statements upon their writings, as well as upon his own explorations. There is an appendix to this section, incorporating information from "Liste des Oiseaux du Kamtschatka et des îlès Commandeurs par le Dr. B. Dybowski et L. Taczanowski," with comments by the author.

The third part—conclusions—is based upon the two preceding sections of the work. The relations of the avifauna of the peninsula to that of the islands are briefly discussed, and are exhibited chiefly in the form of tables giving the circumpolar, palæarctic, Pacific, American, Siberian, East Asiatic, and other forms. The residents and migrants are described at some length, and are catalogued in tables.

Bulletin 30. BIBLIOGRAPHY OF PUBLICATIONS RELATING TO THE COLLECTION OF FOSSIL INVERTEBRATES IN THE UNITED STATES NATIONAL MUSEUM, INCLUDING COMPLETE LISTS OF THE WRITINGS OF FIELDING B. MEEK, CHARLES A. WHITE, AND CHARLES D. WALCOTT, by John Belknap Marcou, 8vo., pp. 333.

This Bulletin is third in the series of "Bibliographies of American Naturalists," and consists of four parts: I, A biographical sketch and list of the published writings of Fielding B. Meek; II, Published writ-

of Charles Abiathar White, introduced by a short biographical
ch; III, A list of the writings of Charles Doolittle Walcott; IV,
iography of publications based upon the palæontological collec-
of the National Museum, by J. W. Bailey, F. A. Conrad, J. D. Dana,
. Ehrenberg, James Hall, Angelo Heilprin, Alpheus Hyatt, Jules
cou, J. S. Newberry, D. D. Owen, James Shiel, B. F. Shumard, R.
Whitfield, and a bibliography of the writings of J. W. Bailey, F. N.
llett, H. A. Prout, B. F. Shumard.

he manuscript for Bulletin 31: THE NORTH AMERICAN SPECIES OF
PHIDÆ, by S. W. Williston, A. M., M. D., was sent to the Public
ter on January 11.

order to insure a more systematic and satisfactory criticism of the
ers offered for publication in the Proceedings and Bulletin, an advi-
committee composed of Dr. Bean, chairman, Professor Mason, Dr.
neger, Professor Ward and Mr. True, has been appointed to ex-
he manuscripts offered for publication.

art IV of this report contains a statement of the publications of the
eum during the fiscal year, and also a bibliography of the papers
fficers of the Museum, and by other investigators whose writings
based upon Museum material. The authors of these papers num-
71, 26 of whom are connected with the Museum, 8 being honorary
ers. The papers number 323, and are thus distributed under the
wing subjects:

Subjects.	By Museum officers.	By other investigators.	Total.
ia Medica	4	0	4
ries	5	0	5
ology	38	0	38
nals	9	6	15
	37	19	56
s	12	32	44
sks	7	4	11
ts	57	2	59
e Invertebrates	6	8	14
tebrate Fossils	4	1	5
s	0	2	2
als	2	1	3
logy	2	0	2
lurgy	3	1	4
istry	1	1	2
imental Physiology and Histology	0	17	17
scopy	19	0	19
ermy	1	0	1
aphy and Bibliography	1	1	2
llaneous	19	1	20
Total	227	96	323

VISITORS.

During the year* the number of visitors to the Museum Building has been 174,225, or an average of 563 persons each day, and to the Smithsonian building 88,960, or an average of 288 each day, as shown in the following table:

Month.	Museum Building.	Smithsonian Building.
1885.		
July	12,509	6,219
August	12,574	9,484
September	14,520	8,313
October	14,001	6,487
November	12,164	5,774
December	15,463	7,550
1886.		
January	12,057	6,235
February	14,398	6,373
March	16,935	8,194
April	20,099	9,318
May	15,034	7,261
June	14,471	7,752
	174,225	88,960

The total number of visitors to both buildings since the record was first kept is given below:

Year.	Museum Building.	Smithsonian Building.
1881	*150,000	.....
1882	†167,455	152,744
1883	202,188	104,823
1884	195,322	91,130
1885 (January–June)	107,365	60,438
1885–86	174,225	88,960
Totals	996,485	498,065

* Estimated on basis of register.

† Estimated on basis of attendance from February 8 to December 31.

STUDENTS AND LECTURES.

As in previous years, all reasonable applications for permission to study the Museum collections have been granted. Mr. G. F. Matthew studied the Lower Cambrian fauna of New Brunswick in the Department of Paleozoic Invertebrate Fossils. Dr. C. Hart Merriam, Dr. R. W. Shufeldt and others have published papers† based upon material

* The Museum was open to the public 309 days in the year.

† See Part IV of this report.

belonging to the Museum. Mr. R. B. Riggs, under Professor Clarke's direction, made full analyses of the lepidolites from Maine, and the cryophyllite and aurite of Rockport, Mass., belonging to the Museum collection, and Mr. George F. Kunz has prepared a description of the collection of gems and ornamental stones.* The material belonging to the Department of Mollusks which was taken north of Cape Hatteras, has been retained for study by Prof. A. E. Verrill, at New Haven. During the winter Prof. E. D. Cope was engaged at the Institution upon special work, on the collections of reptiles; in the course of which he identified all the undetermined Batrachia in the Department of Reptiles, and identified and described collections made by the various correspondents of the Institution in Mexico and in Central and South America. He also completed 650 pages of the report upon the Batrachia of North America. Mr. H. J. Biddle examined a large series of ores from Mexico and Missouri, and metallurgical specimens acquired for the Museum at the New Orleans Exposition, making in all 2,400 determinations. Prof. Fernando Ferrari-Perez, of the Mexican Geographical and Exploring Commission, at the close of the New Orleans Exposition, and at the invitation of the Institution, brought to Washington for examination a large collection of natural history specimens. Every possible facility was offered him at the Institution for the arrangement and study of this collection, the curator of birds and the curator of mammals assisting him in determining the species. The visit of Professor Perez resulted beneficially for the Museum, since a large portion of this collection was given the Museum in exchange for material afterwards sent him. The curator of birds says concerning the collection of birds received from the Commission: "This exceptionally fine collection, as regards preparation of the specimens, which had been mounted entirely from fresh specimens, was of very great interest and benefit to the department, affording as it did several suggestions of practical value and much-needed material for study, including no less than five more or less remarkable new species." A catalogue of this collection was prepared by Prof. Ferrari-Perez and was published in Proceedings U. S. National Museum, Vol. IX, pp. 125–299.

A number of students were granted permission to associate themselves with a department in the Museum as volunteer workers. Lieut. T. Dix Bolles, U. S. Navy, rendered valuable assistance in the Department of Ethnology. Mr. H. H. James was received into the Mineral Department. Lieut. Charles Barnes, U. S. R. M., spent a short time in the osteological laboratory previous to his departure for Texas. In the taxidermist's laboratory Mrs. Berdell and Mr. William Crane received instructions in skinning birds and making bird skins. Mr. E. S. Lewis studied in the Department of Lithology and Physical Geology. Eight pupils have been instructed in Photography: Mr. George P. Merrill, Mr. J. T. Brown, and Mr. W. Hough, of the Museum; Mr. O. H. Dodge;

*Popular Science Monthly, April, 1886.

Lieutenant Winterhalter and Dr. Nash, of the U. S. Navy; Mr. Thomas Lee, of the U. S. Fish Commission, and Mr. H. L. Turner, of the Geological Survey. Mr. Dodge has already rendered valuable services in photography to the Museum. Mr. Merrill has photographed for his own department numerous stone quarries, mud cracks, drift bowlders, etc. From Mr. Thomas Lee have been received several valuable negatives which he made on the cruise of the *Albatross*.

The Saturday Lectures, given under the joint auspices of the Anthropological and Biological Societies of Washington, were delivered, as in previous years, in the Lecture Hall. The programme of the course was as follows:

Saturday, March 6.—Mr. WILLIAM HALLOCK: The Geysers of the Yellowstone.
Friday, March 12.—Prof. WILLIAM HARKNESS: How the Solar System is Measured.
Saturday, March 30.—Prof. T. C. MENDENHALL: The Nature of Sound.
Saturday, March 27.—Prof. F. W. CLARKE: The Chemistry of Coal.
Saturday, April 3.—Dr. C. HART MERRIAM: The Migration of Birds.
Saturday, April 10.—Dr. WASHINGTON MATTHEWS, U. S. Army: The Gods of the Navajos.
Friday, April 16.—Dr. D. B. SIMMONS: Social Status of the Women of Japan.
Saturday, April 24.—Prof. W. K. BROOKS: Life.
Saturday, May 1.—Mr. LESTER F. WARD: Heredity and Opportunity.
Saturday, May 8.—Dr. J. S. BILLINGS, U. S. Army: Animal Heat.

(*f*) MEETINGS OF SOCIETIES.

As in previous years, several societies have availed themselves of the privilege of using the Lecture Hall for their meetings. These have been the National Academy of Sciences, the Biological Society of Washington, Entomological Society of Washington, and the Meteorologists' Convention.

Since the papers read at the meetings of these societies have in many instances related to the work of the Museum, and were illustrated by Museum specimens, the titles are given below:

NATIONAL ACADEMY OF SCIENCES.

(Meetings April 20, 21, 22, 1886.)

G. K. GILBERT.—The Geologic Age of the Equus Fauna.*
T. STERRY HUNT.—The Cowles Electrical Furnace.*
E. D. COPE.—On the Phylogeny of the Batrachia.*
E. D. COPE.—On the Phylogeny of the Placental Mammalia.*
H. A. NEWTON.—The Comet of Biela.*
ELIAS LOOMIS.—Areas of High Barometric Pressure over Europe and Asia.‡
S. H. SCUDDER.—The Cockroach in the past and in the present.†
ALFRED M. MAYER.—On the diathermancy of Ebonite and Obsidian, and on the production of Calorescence by means of screens of Ebonite and Obsidian.†
ALFRED M. MAYER.—On the Coefficient of Expansion of Ebonite.†
ALFRED M. MAYER.—On the determination of the Cubical Expansion of a solid by a method which does not require calibration of vessels, weighings, or linear measure.†
ALFRED M. MAYER.—On Measures of absolute Radiation.†
E. D. COPE.—On the Geology of the region near Zacualtipan, Hidalgo, Mexico.‡

* Read April 20. † Read April 21. ‡ Read April 22.

EDWARD S. MORSE.—On ancient and modern methods of arrow release.*

THEODORE GILL.—The ordinal and super-ordinal groups of Fishes.†

H. A. ROWLAND.—On the absolute and relative wave lengths of the lines of the Solar Spectrum.†

WOLCOTT GIBBS.—Platinous compounds as additive molecules.†

IRA REMSEN.—Influence of Magnetism on Chemical Action.†

ALEXANDER GRAHAM BELL.—Upon the Deaf and Dumb of Martha's Vineyard (continuation of research relating to the ancestry of the Deaf).

S. P. LANGLEY.—On the Invisible Spectra.*

G. F. BECKER.—Cretaceous Metamorphic Rocks of California (by invitation).†

OGDEN N. ROOD.—On color contrast.

CHARLES D. WALCOTT.—Classification of the Cambrian System of North America (by invitation).

A. W. WRIGHT.—Crystallization of Platinum by means of the electric discharge in vacuo.†

W. K. BROOKS.—The Stomatopoda of the "Challenger" collection.†

W. K. BROOKS.—Budding in the Tunicata.

A. W. WRIGHT.—Effect of Magnetization on the electrical resistance of Metals.

R. E. PEARY, U. S. Navy.—On a proposed expedition into the interior of Greenland during the present summer with Disco as a base (by invitation).

BIOLOGICAL SOCIETY OF WASHINGTON.

The first of the fortnightly meetings held during the year was the eighty-second regular meeting of the society.

(October 31, 1885.)

MARSHALL MCDONALD.—Fish-culture a necessity for the maintenance of the shad fishery.

WILLIAM H. DALL.—Deep-sea Mollusks and the laws illustrated in their development.

RICHARD RATHBUN.—Remarks on the Wood's Holl Station of the U. S. Fish Commission.

ROMYN HITCHCOCK.—Notes on the Red Snow, with exhibition of specimens.

(November 14, 1885.)

RICHARD RATHBUN.—Remarks on the Wood's Holl Station of the U. S. Fish Commission.

W. S. BARNARD.—Specimen mounting case and method.

JOHN A. RYDER.—A new and practical system of raising oysters on a large scale.

FREDERICK W. TRUE.—On a spotted dolphin apparently identical with the *Prodelphinus doris* of Gray.

(November 28, 1885.)

THEOBALD SMITH.—A simple device for storing cover-glass preparations illustrative of bacterial disease.

W. S. BARNARD.—1. Environmental digestion; 2. Specimen mount, tube-holders, labels and stoppers.

C. HART MERRIAM.—The work of the U. S. Department of Agriculture in economic ornithology.

CHARLES D. WALCOTT.—Evidence of the loss of vital force in certain Trilobites on approaching extinction.

FREDERICK W. TRUE.—A new study of the American pocket-rats: genus *Dipodomys*.

* Read April 21. † Read April 22.

(December 12, 1885.)

J. M. FLINT, U. S. Navy.—Exhibition of representative specimens of *Foraminifera* from the dredgings of the U. S. Fish Commission steamer *Albatross*.

ROMYN HITCHCOCK.—The Red Snow.

W. S. BARNARD.—Digestion; environmental, etc.

C. V. RILEY.—The Mildews of the Grape-vine.

C. HART MERRIAM.—Description of a new subspecies of the common eastern Chipmunk, *Tamias striatus*.

(December 26, 1885.)

C. HART MERRIAM.—Contributions to North American Mammalogy. 1. The genus *Tamias*.

FRANK H. KNOWLTON.—Multiplication in the Gynœcium of *Datura stramonium*, L.

OTIS T. MASON.—Mutilations of the human body.

On January 9 and 23, 1886, the sixth annual meeting (eighty-seventh and eighty-eighth regular meetings) for the election of officers was held.

On February 6, 1886, the annual address was delivered by Mr. G. Brown Goode, the president of the Society, the subject being "The beginnings of American Natural History."

(February 20, 1886.)

ROMYN HITCHCOCK.—Demonstration of the resolving power of a new one-sixteenth-inch objective.

D. E. SALMON and THEOBALD SMITH.—On a new method of producing immunity from contagious diseases.

C. V. RILEY.—A carniverous butterfly larva.

LESTER F. WARD.—The Plane-tree and its ancestors.

C. HART MERRIAM.—Contribution to North American Mammalogy. 2. Description of a new species of *Aplodontia*.

GEORGE VASEY.—New and recent species of North American Grasses.

(March 6, 1886.)

GEORGE VASEY.—New and recent species of North American Grasses.

CHARLES HALLOCK.—Hyper-instinct of animals.

W. S. BARNARD.—Exhibition of a fungus, with remarks.

H. G. BEYER, U. S. NAVY—Remarks on Antipyretics.

(March 20, 1886.)

D. E. SALMON and THEOBALD SMITH—Notes on some biological analyses of Potomac drinking-water.

H. G. BEYER, U. S. NAVY—Remarks on Antipyretics.

W. S. BARNARD—Exhibition of a fungus, with remarks.

FRANK H. KNOWLTON—Additions to and changes in the Flora Columbiana for 1885.

FRANK BAKER and J. L. WORTMAN—Recent investigations into the mechanism of the elbow-joint.

(April 3, 1886.)

FRANK BAKER and J. L. WORTMAN—Recent investigations into the mechanism of the elbow-joint.

JOHN B. SMITH—Some peculiar secondary sexual characters in the Deltoids, and their supposed function.

C. HART MERRIAM—Contributions to North American Mammalogy. 3. Description of a new subspecies of Gray Squirrel.

. W. SHUFELDT, U. S. ARMY—Some early, and as yet unpublished, drawings of lubon.
HEODORE GILL—The characteristics and families of iniomous fishes.

(April 17, 1886.)

HEODORE GILL—The characteristics and families of iniomous fishes.
REDERIC A. LUCAS—Notes on the vertebræ of *Amphiuma*, *Siren*, and *Menopoma*.
REDERICK W. TRUE—1. Exhibition of a wood hare with abnormal growth of . 2. Some distinctive cranial characters of the Canadian Lynx.
. E. C. STEARNS—Instances of the effect of musical sounds on animals.
OHN B. SMITH—Ants' nests and their inhabitants.

(May 1, 1886.)

. E. C. STEARNS—Instances of the effect of musical sounds on animals.
OHN A. RYDER—The evolution of the mammalian placenta.
. H. BEAN—The trout of North America, with exhibition of specimens.
VILLIAM H. DALL—1. On the attachment of *Lingula*, with exhibition of specins. 2. On the divisions of the genus *Pecten*.

(May 15, 1886.)

OHN B. SMITH—Ants' nests and their inhabitants.
. H. BEAN—The trout of North America, with exhibition of specimens.
. O. HOWARD—On some new *Chalcididæ*.
. HART MERRIAM—Habits of the Short-tailed Shrew.

(May 29, 1886.)

OHN B. SMITH—Ants' nests and their inhabitants.
. H. BEAN—The trout of North America, with exhibition of specimens.
. O. HOWARD—On some new *Chalcididæ*.
ESTER F. WARD—Exhibition of a specimen of the Palo la Cruz, or Wood of the ss.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

(November 18, 1885.)

TTO LUGGER—On the earlier stages and habits of *Cœnia dimidiata*.
. P. MANN—On the Dewey decimal system of classifying and arranging books.
. B. SMITH—On Dr. Gerstæcker's paper on the systematic position of the genus *ocoma* Le C.
. O. HOWARD—On *Thoracantha floridana* Ashmead.

(December 3, 1885.)

. B. SMITH—On the occurrence of *Pleocoma Behrensi* in Utah Territory.
. B. SMITH—On the larva of *Aphorista vittata*.
. V. RILEY—On the larval habits of *Lixus macer* and *L. parcus*.
. A. SCHWARZ—On the food-habits of an undescribed calandrid beetle.
. O. HOWARD—On the larval respiration in *Corydalus cornutus*.
. P. MANN—On the use of the Dewey decimal system.

(January 7, 1886.)

Annual address of the retiring President, Prof. C. V. Riley.

. OSBORN—Observations on certain species of *Hemiptera*.
TTO LUGGER—On the life-habits of *Mesites subcylindricus* and *Platypus flavicornis*.
. V. RILEY—On the larvæ and pupæ of *Aphorista vittata* and *Epipocus punctatus*.

(February 12, 1886.)

C. V. RILEY—On the food-habits of the larva of *Fenesica tarquinius*.
L. O. HOWARD—On the Chalcid genus *Podagrion*.
OTTO LUGGER—On a new pattern of Aquarium.
J. B. SMITH—On the odoriferous apparatus in *Lepidoptera*.

(March 4, 1886.)

L. O. HOWARD—On a parasite of *Cynips quercus-saltatorius*.
J. B. SMITH—On the structural characters of the *Attacinæ* and *Ceratocampinæ*.
GEORGE MARX—On the structural characters of *Thelyphonus giganteus*.
E. A. SCHWARZ—On the rediscovery of *Rhyncolus corticalis* Boh.

(April 1, 1886.)

E. A. SCHWARZ—On the life-history of some North American *Scolytidæ*.
J. B. SMITH—On some features in the structure of the family *Saturniidæ*.

(May 13, 1886.)

GEORGE MARX—On the structural characters of the genus *Phrynus* and on the classification of the family *Phrynidæ*.
E. A. SCHWARZ—On the oviposition of *Xyleborus celatus* and on the galleries of *Monarthrum mali*.

(June 3, 1886.)

J. B. SMITH—On the scent organs in the males of *Leucarctia acræa* and *Pyrrharctia isabella*.
E. A. SCHWARZ—On a new food plant of *Pieris rapæ*.
OTTO LUGGER—On the introduction of certain foreign *Coleoptera* into North America.
OTTO LUGGER—On the fertilization of *Cypripedium acaule* and the Hard Maple.
L. O. HOWARD—On a remarkable case of muscular force exhibited in *Canthon vigilens*.
E. A. SCHWARZ—On the Bracouid parasite of *Pissodes strobi*.

A convention of meteorologists was held on February 24 and 25: General William B. Hazen, Chief Signal Officer, in the chair.

2. CURRENT ADMINISTRATIVE WORK.

(*a*) BUILDINGS AND LABOR, POLICE AND PUBLIC COMFORT.

The regular staff for police and inspection under the supervision of Henry Horan, superintendent of buildings, has included an assistant superintendent, a clerk, an inspector, eight watchmen, five door-keepers; for construction, care of buildings, and repairs, five carpenters, a painter, and a stone-cutter; for labor and cleaning, nineteen laborers (three of whom are constantly detailed to watchmen's duty), three attendants, and five cleaners. For heating and lighting there were employed an engineer and, for the greater part of the year, five firemen. In the department of police and inspection, the services of an assistant superintendent and four watchmen have been dispensed with. For construction and repairs, the force has been decreased by three carpenters and two painters.

The following abstract of the report of the Superintendent of Buildings for the year will serve to show the various ways in which the mechanics and laborers have been employed:

July.—The unloading and storage of the metallurgical exhibits from Philadelphia were completed. The arrival from the New Orleans Exposition of the Smithsonian collections commenced, and the boxes as soon as received were stored temporarily in the lecture hall. This was a work of great labor, and demanded the assistance of almost the entire laboring force. A portion of the collection of fossil plants was removed to the northwest gallery in the Smithsonian building, which had been assigned as a laboratory for the department. The Indian spears were removed from the Anthropological Hall in the Smithsonian building to the northeast gallery, for classification and re-arrangement. The exhibit of the Department of Agriculture at New Orleans was received and placed in the Museum building. The shelving in the main hall of the Smithsonian building—devoted to the display of mounted birds—was changed in accordance with the wishes of the curator of birds. This work occupied the time of carpenters and painters for several weeks. Five one-fourth unit sections were constructed for the Department of mammals, and the flat-top cases in which the gem collection had been exhibited at New Orleans were restored to the Mineral Hall.

August.—The carpenters commenced fitting and arranging shelving in the floor-upright cases in the west hall. Nine pedestals for the Department of Comparative Anatomy were finished and placed in the Exhibition Hall.

September.—The erection of a new case for the Department of Birds was commenced. The work of making and fitting shelving for the slope cases in the Department of Minerals, and the construction of diaphragms for the cases in the Department of Metallurgy were begun. The wooden annex building was moved 60 feet towards the west. Slope cases were arranged in the Gothic Hall, Smithsonian building, for the reptile casts. Table-cases were arranged in the laboratory and exhibition hall of the Department of Mollusks, and five hundred trays fitted for the same.

October.—Screens were placed along the galleries in the Smithsonian building in order to secure greater privacy to the curators to whom laboratories have been assigned there. The columns and walls of the main hall of the Smithsonian building were cleaned and repainted. The boat models, returned from New Orleans, were unpacked and replaced on exhibition in the hall assigned to the section of naval architecture. A portion of the metallurgical exhibit in the west hall of the Museum building was transferred from temporary pedestals to exhibition cases. The Mexican casts were installed on pedestals prepared by the carpenters for their reception. A large number of empty cases were removed from the northeast court. The re-opening of the Exposition at New Orleans caused the repacking and reshipment thither of a large portion of the exhibit of the State Department, which had been transferred to the custody of the Museum. Shelves were arranged in the balconies of the rotunda for the reception of living plants.

November.—The collection of musical instruments was removed from the east hall to the north hall, and the ethnological exhibits were re-arranged.

Models and relief maps, received from the Geological Survey, were placed upon exhibition. Shelving was arranged around the west basement of the Smithsonian building for the convenience of the department of fishes. The repair of cases injured on the journey to and from New Orleans was commenced. The work-rooms of the taxidermist and osteologist, in the annex building, were ceiled. The collection of scientific instruments was removed from the east to the north hall.

December.—Skylights were placed in two of the rooms on the west balcony and in one room on the south balcony. The "knock-down" cases from New Orleans, which had been temporarily stored in the lecture hall, were removed to the east entrance, preparatory to being taken apart and placed in storage. A re-arrangement of the mass of material in the Armory building was effected, under the supervision of the

registrar. A partition was built in the northeast end of the annex building, and the gallery and ceiling extended.

The hip-cases, returned from New Orleans, were placed in the hall devoted to the fishery exhibit, and the fish-casts removed from the southeast court and arranged in them. The radiators were removed from along the wall in the northeast court further out into the hall, in order to admit the wall-cases intended for the display of furs. An experiment was made in frosting one of the windows in the main hall, Smithsonian building, in order to exclude the strong sunlight from the bird exhibit. A new style of case, resembling a bay window, was constructed for the northeast court, and proved satisfactory. The locomotive "John Bull," presented to the Museum by the Pennsylvania Railroad Company, was removed from the Armory building and placed on exhibition in the north hall of the Museum building. Shelving for cases, the fitting of locks and of trays, the construction of packing-boxes, the glazing of cases, the erection of screens, painting of walls, etc., the construction of new doors for some of the cases used in the department of birds, the relaying of floors, the fitting up some of the galleries in the Smithsonian building, and the construction of pedestals for exhibition purposes, occupied a great deal of time.

January.—The construction of a half-pillar case was commenced. The work of making diaphragms for hanging photographs in the Fishery Hall was continued. A small room on the south balcony was fitted up for the curator of plants. The long hip-case in the Fishery Hall was painted and glazed. All the boxes, etc., which had been stored in the Lecture Hall, were removed, and the hall prepared for the course of Saturday lectures, to commence March 6. Pedestals were made for the Egyptian figures in the north hall. Much time was spent by laborers in clearing snow from the sidewalks. The dark room on the second floor of the northwest pavilion was fitted with shelves. A file-case was constructed for the assistant director's office. The large Indian canoe in the section of naval architecture was suspended from the ceiling. Several of the doors leading to the vaults and storage-rooms in the Smithsonian building were lined with tin, with a view to rendering these apartments comparatively fire-proof. The totem-posts were removed from the statuary hall to the south wall of the west hall.

February.—A portion of the annex building was partitioned off as a laboratory for the Invertebrate Fossils. A railing was built in the Pottery Hall, thus cutting off a portion of the hall required for assorting and repairing specimens. The construction of settees for the rotunda was commenced by the Museum carpenters. The shelving in some of the cases in the Anthropological Hall was refitted.

March.—The tin roof over the Gothic Hall, Smithsonian building, was repaired. A railing was built around the lecture hall to protect the Catlin pictures, and in the section of naval architecture as a protection to some of the boat models which are fastened against the wall. An extension of the diaphragms to which the Catlin pictures are fastened was commenced. A sloping map-case for the department of lithology was completed. An old vault under the north entrance to the Smithsonian building was fitted with shelving for the storage of fish-casts, molds, etc. The settees, diaphragms, etc., already referred to, were painted, and also the five pine table-cases for the department of invertebrate of fossils. The Peruvian pottery was removed from the Smithsonian building to the Museum. Two storage rooms in the west basement of the Smithsonian building were arranged with shelving for the departments of marine invertebrates and mollusks. The Indian pottery, which had been stored behind the wall-case in the northeast court, was removed to the basement rooms in the east wing of the Smithsonian building. Three arch-screens were finished by the Museum carpenters. Unit table-cases were painted for the department of ethnology, and a double arch-screen was erected at the entrance to the lecture hall. Work upon eight settees for the Rotunda were commenced by the Museum carpenters.

April.—The construction of a large open screen by the Museum carpenters for the west entrance was commenced. The telephone room was frescoed and painted. A

large case was made for the filing of duplicate labels. The large sheet of plate glass was fitted in the fur-seal case. A large sink with water connection was provided for the annex building. The collection of snow-shoes was removed from screens in the east hall and arranged on diaphragms over pier-cases.

May.—The painting of some old flat-top cases in the main hall of the Smithsonian building, for the department of mollusks, was commenced. Carpenters were engaged for eight days in making alterations in the large wall-case at the west end of the Anthropological hall, Smithsonian building. Casters were placed on some of the cases in the southeast court, thus removing the cases and their contents out of the way of dampness. The large wall-case just referred to was painted. Work was commenced on the preparation of two hundred oak blocks for the installation of spears. A car-load of specimens received from New Orleans was stored in the southeast court.

June.—The construction of settees for the Rotunda was completed. The large ebonized cases for the Pottery hall were glazed, and locks were adjusted to cases in the departments of lithology and comparative anatomy. Much was done in painting walls, glazing and painting cases, diaphragms, pedestals, blocks, and label frames.

During the year, besides the regular force, there were employed additional carpenters, laborers, and painters, as occasion demanded.

(*b*) Electric Service.

In the basement of the Smithsonian building and in the main and anthropological halls there have been placed electric call-bells for the purpose of calling the superintendent during business hours and the watchmen during the hours after the building is closed to the public. Signal buttons have been placed near the bells.

The watch-clock system, which has been in use for eight years, has been re-constructed and put in good order. Three electric time-clocks have been placed in the main exhibition hall and connected with the standard clock in the Museum building. The annex building, carpenter-shop, and paint-shop have been furnished with watch-clock service.

A large gong has been placed outside of the east entrance for the purpose of calling employés outside of the main building.

The library has been connected with the office of the mammal department by means of a call-bell, and the engine-room is now similarly connected with the photograph gallery.

The time service, watch-clock service, and call-bell service have been kept in good order.

An electrical hydrostatic indicator has been placed in the Armory building.

Two call-bells have been placed in the south towers. The time clocks are worked by a battery of fifty cells, a battery of forty-five cells working the other systems. These are in excellent condition.

Considerable difficulty has been encountered in keeping the intrenched wires in order, on account of the heat and condition of the trenches.

A list of the electrical apparatus in the National Museum at the end of June, 1885, was given in the last report,* since which date no important additions have been made.

* Pages 27–29.

(c) Cases and Fixtures.

During the year ending June 30, 1886, $21,521.24* was expended out of the $40,000 appropriated for furniture and fixtures, for exhibition cases, screens, unit drawers and trays, tablets, stands, unit boxes, lumber, plate glass, locks, brackets, and other necessary fittings; $3,171.93 has been expended for glass jars for holding specimens; $632.91 was expended for furniture for exhibition halls and offices; $1,771.96 was expended for apparatus for laboratories, halls, and repairs; $278 was expended for grate and boiler fixtures—a total of $27,376.04.

There was also expended, out of the furniture and fixtures appropriation, for wages of mechanics and laborers, and salaries of property clerk, accountant, copyist, and other necessary employés, $12,578.91,† leaving a balance of $45.05.

(d) Property and Supplies.

The methods employed in the department of supplies have been greatly improved during the year under the administration of W. V. Cox, chief clerk of the Museum. The force of clerks has been temporarily increased, and steps have been taken toward the completion of the records, some of which were in an imperfect condition, owing to the rapid growth of the Museum since its reorganization.

Experience has proven that when a large supply of articles is kept in stock there is a greater tendency to waste and extravagance than when the supply is limited. In other words, no economy has been found

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* The following cases, screens, unit drawers, etc., have been made for the Museum during the year by outside constructors:

25 mahogany unit table cases	$2,150.00	1 pair storm doors	83.50
15 white pine unit table cases	672.45	15 mahogany and ash frames	26.25
16 mahogany half unit table cases	768.00	1 white pine base	20.00
5 white pine half unit table cases	150.00	5,429 unit drawers and trays	2,871.74
2 white pine Salvin bird cases	157.88	54,440 pasteboard trays, boxes, and covers	1,709.60
1 white pine sectional library case	21.00	14,984 tablets for mounting specimens	975.15
4 white pine ¼-unit table cases	78.40	763 bird stands and wire nests	95.90
1 white pine card catalogue case	16.00	100 insect boxes and cork for lining	128.50
7 Kensington cases	478.00	18,200 label-holders	85.55
1 white pine photo-microscope case	36.00	1,689 plate glass	2,324.42
1 white pine file case	32.50	530 locks	817.95
2 herbarium cases	165.00	1,000 brackets and hooks	199.00
10 redwood insect cases	607.00	File boxes and holders	50.42
1 ash seal case	135.00	Drawings for cases, etc	808.00
1 walnut case remodeled	85.00	Traveling expenses to inspect cases	12.91
9 fold screens, one-half pillars	667.00	Interior and other necessary fittings	2,674.53
10 poplar arch screens	150.00	Lumber	2,467.71
1 oak mosaic screen	59.00		
30 fold screens	69.00	Total	21,521.24
1 mineral dresser	24.00		

The following cases, diaphragms, pedestals, etc., have been made in the Museum carpenter shop.

7 mahogany slope cases, half size.
3 storage cases.
7 poplar arch-screens.
10 oak settees.
26 white pine bases.
4 oak bases.
16 diaphragms.
1 cherry desk.
1 walnut file case.
1 mahogany file case.
1 mahogany case for maps.
1 mahogany file and drawers for case.
20 walnut pedestals, assorted sizes.

† The highest salary paid was that of property clerk, $100 per month; lowest, copyist, $70 per month; average, $82.50. The greatest number of employés in a month was 30; the smallest, 7; an average of 16$\frac{4}{11}$. The highest wages paid mechanics and laborers was $3 per day; lowest, $1.50; average, $2.25.

in buying larger quantities, even at a cheaper rate, than when only sufficient supplies for immediate use are procured. Therefore only articles of every-day use are now kept on hand.

The method of procedure in issuing supplies has been changed. The usage of the present time provides that the heads of departments shall file a requisition, as formerly, for whatever may be required in his work. If the articles are of a kind usually kept in stock, this requisition is presented to the property clerk, who attends to it and makes proper entries in his books. If the articles are not in stock, the requisition is sent to the chief clerk of the Museum, who mails proposals to established firms or manufacturers for the articles required. Upon the return of the proposals, the prices are inserted on the original requisition and it is sent to the Assistant Secretary for action. If the expenditure be authorized, the requisition is approved and returned to the chief clerk of the Museum, who makes out an order for the articles, sending also a notification to the property clerk for his guidance. The firm is required to deliver the articles, with a memorandum bill, to the registrar, who makes an entry of them in his books and turns the articles over to the property clerk. This officer delivers them to the person making the requisition, at the same time obtaining his receipt. This form is filed by the property clerk in his office. Itemized bills, giving the number of the orders, are required to be presented in duplicate each month. These bills are examined by the property clerk, and if found to correspond to the notification in regard to quantity and price are certified to by him. The property clerk retains one of the certified bills and sends the other to the chief clerk of the Museum, who compares it with the stubs in the order-book. If it is found to correspond to the orders, it is referred to the Assistant Secretary, who directs that it be paid. The bill is then sent to the chief clerk of the Smithsonian Institution, to be transferred to official forms. The voucher passes through the same hands as did the original bill and undergoes the same scrutiny and is ready for payment when it receives the approval of the Secretary of the Smithsonian Institution.

Should a curator desire to make the selection of the articles himself, as scientific apparatus, for instance, a special form giving him that permission is furnished. This form, which states that the charges are just and reasonable, the curator signs, after obtaining the articles, and transmits with the bill to the property clerk, as in the case just mentioned. Proper entries are made in the books, so that at any time it is easy to ascertain the cost of articles and the amount expended for any department. It will be seen that, with so many checks and counterchecks, the Museum interests are in every particular safely guarded, and what may appear cumbersome routine after all greatly facilitates the obtaining of supplies, accounting for the same, as well as the settlement of bills.

All the cases, furniture, etc., belonging to the Museum are stamped

with the Museum cipher and numbered. Supplies are issued upon requisitions approved by the Assistant Secretary, which are filed with the property clerk, and the articles in each case are charged up to the department to which they have been assigned.

Another change that has been made during the year has been the appointment of a committee of experts to examine all cases, articles of furniture, etc., to see that the contractor has performed his part of the contract, and that the articles are up to Museum standard, and therefore in proper shape for acceptance. A second committee inspects lumber, in order to see that it is of the kind ordered, of the proper dimensions, and is satisfactory for the purposes for which intended. A third committee examines the unserviceable property of the Museum, and reports what action in their judgment is desirable. These committees have performed their duties faithfully and with very satisfactory results, relieving this office at the same time of much detail and labor.

(e) Correspondence and Reports.

The Museum correspondence, which is under the charge of the executive clerk, Mr. R. I. Geare, has very largely increased during the year. There have been written for the signatures of the Secretary and Assistant Secretary 1,169 letters and 1,001 acknowledgments of accessions, and 209 reports upon specimens sent for examination have also been prepared.

(f) Preparation of Labels.

Five thousand eight hundred and sixty forms of labels have been printed at the Government Printing Office, as shown in the following table:

Department.	No. of forms.	Department.	No. of forms.
Metallurgical	1,111	Ethnological	121
Materia medica	1,407	Mammals	34
Birds	940	Textiles	274
Shells	264		
Fishes	503	Total	5,860
Building stones	1,205		

Several hundred lables have also been printed in the Museum.

3. THE WORK OF THE MUSEUM PREPARATORS.

(a) Taxidermists.

The work of the year was opened by a journey of the chief taxidermist to Keene, N. H., in company with Mr. F. A. Lucas, the osteologist, to receive a full-grown Indian elephant, named "Albert," which was shot by order of Hon. P. T. Barnum at that town on July 20, and presented to the National Museum. The preparators reached the elephant about thirty-four hours after its death, and, with the aid of four butchers, the animal was quickly dissected. In two days the skin was removed

and successfully preserved. All the bones of the skeleton were "roughed out," and on the third day skin and skeleton were boxed securely and shipped to Washington. The skin weighed 1,080 pounds, and when removed was in some places 1¼ inches in thickness. Upon its arrival at the taxidermic laboratory it was preserved in a soft state, to be mounted as soon as practicable.

Among the other important acquisitions of fresh specimens received during the year were a very fine Burchell's zebra, a royal Bengal tiger, a horse antelope, water-buck, white-faced antelope, an eland, a llama, and a black macaque.

Of the specimens mounted by the chief taxidermist, Mr. William T. Hornaday, the Bengal tiger and the Burchell's zebra seem worthy of especial mention.

These two specimens may fairly be regarded as showing the possibilities of taxidermy in the treatment of difficult subjects. It is especially worthy of note that they are both so substantially mounted in every part as to render them essentially imperishable if kept under glass.

Among other specimens mounted during the year were a number of very fine and rare ungulates of large size, including a water-buck, African wild sheep, white-faced antelope, llama, and others; a very large and handsome leopard; a cheetah; an elephant-seal 11 feet in length, and a series of very fine kangaroos.

Work in the laboratory was interrupted during seven weeks of May and June by the exploration for buffalo in Montana, undertaken by Mr. Hornaday and his assistant, A. H. Forney, accompanied by Mr. George H. Hedley, of Medina, N. Y. On account of the fear that it might be impossible to find buffalo at all, or at least without a search of three or four months, a start was made in the spring with the hope of finding animals before they would commence to shed their hair.

By hard work and good fortune a few buffalo were found in Montana, but by the time the first specimens were killed they had shed their hair to such an extent as to render their skins not fit to mount as typical specimens of the species. Accordingly the party returned immediately with the collection already made, to go out again in October to finish the work. A report of this exploration will be published after the work is completed, including a list of the collections made by the party during the month spent in the field.

A very important item of the work done by the chief taxidermist has been the installation of the exhibit of the Society of American Taxidermists, which is now very attractively displayed along the north side of the northeast court. It is greatly admired, and by many visitors is carefully studied.

List of mammals, etc., mounted by the Taxidermists of the U. S. National Museum during the year 1885–'86.

PRIMATES.

15323. Macacus maurus (Black Macaque).
15126. Semnopithecus cucullatus (Black Langur).

CARNIVORA.

14337. Felis leopardus (Leopard).
14397. Felis jubata (Cheetah).
13661. Felis ornatus.
1638. Felis catus.
15041. Canis occidentalis (Gray Wolf).
14267. Canis familiaris (St. Bernard Dog).
15173. Cercoleptes caudivolvulus (Kinkajou).

PINNIPEDIA.

14629. Macrorhinus angustirostris (Elephant Seal, 11 feet long).

UNGULATA.

15120. Equus burchelli (Burchell's Zebra).
14997. Kobus ellipsiprimnus (Water-Buck).
14956. Damalis pygarga (White-faced Antelope).
13069. Ovis tragelaphus (African Wild Sheep).
13829. Nemorhedus crispa (Japanese Goat).
14114. Cervus columbianus (Black-tailed Deer). Head.
14999. Cervus dama (Fallow Deer).
15250. Llama glama (Llama).

RODENTIA.

15172. Synetheres prehensilus.

MARSUPIALIA.

15772. Macropus rufus ♂ (Red Kangaroo).
15228. Macropus rufus ♀ (Red Kangaroo).
15297. Macropus rufus ? (Red Kangaroo).
15295. Macropus robustus (Great Rock Kangaroo).
15299. Macropus parryi (Parry's Kangaroo).
15300. Halmaturus dorsalis (Black-striped Kangaroo).
15302. Halmaturus ruficollis (Red-necked Kangaroo).
15303. Halmaturus temporalis.
15304. Halmaturus thetidis (Pademelon Kangaroo).
15310. Phascolarctos cinereus (Koala).

MISCELLANEOUS OBJECTS MOUNTED.

Hexanchus griseus (Gray Shark), 10 feet 8 inches long.

MISCELLANOUS WORK DONE.

33 mounted mammals were repaired.
154 mounted mammals from New Orleans were cleaned and cased.
20 skulls were removed from skins of mammals.
24 dry skins were relaxed, shaped, dried, and dressed.
5 dry skins were poisoned.
1 fur suit was repaired and dressed.
17 boxes of specimens were packed for shipment.
43 boxes of specimens were unpacked and distributed.
4 students received instructions in taxidermic methods.

One circular of directions was written for publication, and material for four illustrations was prepared.

The exhibit of the Society of American Taxidermists was prepared for exhibition and installed.

List of mammals in the flesh secured during the year.

PRIMATES.

5323. Cynopithecus niger.
5357. Cebus hypoleucus (White-throated Capuchin).
5381. Cercocibus albigena.
5482. Cercopithecus diana (Diana Monkey).
15251. Macacus pelops.

UNGULATA.

15120. Equus burchelli (Burchell's Zebra).
15215. Hippotragus equinus.
15250. Llama glama (Llama).
15318. Cervis axis porcarius.
22185. Oreas canna (Eland).
22187. Ovis tragelaphus (African Wild Sheep).
15347. Cervus porcinus.

PROBOSCIDEA.

15142. Elephas indicus, "Albert" (Indian Elephant), 8¼ feet high.

CARNIVORA.

15387. Felis tigris (Tiger).
15230. Felis leopardus (Leopard).
15173. Cercoleptus caudivolvulus (Kinkajou).
15258. Putorius erminea (Ermine).

RODENTIA.

15172. Synetheres prehensilis.
15220. Synetheres prehensilis.
15249. Sciurus niger cinereus (Northern Fox Squirrel).
15320. Sciurus aureogaster (Red-bellied Squirrel).
15280. Erethrizon epixanthus (Western Porcupine).
15352. Dasyprocta isthmica.

MARSUPIALIA.

15174. Macropus walabatus (Black-tailed Kangaroo).
15228. Macropus rufus (Red Kangaroo).

Mr. Henry Marshall has, as usual, worked under the direction of the curator of the department of birds, and a great deal has been accomplished by him during the year.

(*b*) OSTEOLOGICAL PREPARATOR.

The following table shows the number of osteological specimens prepared or mounted by Mr. F. A. Lucas during the year, as well as the number of animals received in the flesh, whose rough preparation involved an outlay of considerable time and labor:

	Mammals.	Birds.	Reptiles.	Batrachia.	Fishes.
Received in the flesh:					
Entire skeletons	39	6	3	1	6
Incomplete skeletons	8	1	.....	.....	.....
Cleaned:					
Entire skeletons	23	9	11	5	5
Skulls	25	14	.....	.....	90
Incomplete skeletons	4	7	.....	.....	.....
Mounted:					
Entire skeletons	19	12	10	2	12
Skulls	11	9	.....	.....	.....
Limbs and other pieces	25	8	4	.....	3

This table gives a total of 372 specimens on which work was done during the year, including one whale 20 feet in length, and the full-grown elephant "Albert." In addition to the work noted above, the plaster cast of the Giant Tortoise (*Colossochelys*) has been mounted in

the Museum Building and completely repaired, and numerous skeletons transferred from pedestals of various patterns to others of the now adopted standards. The rapid accession of material has necessitated numerous re-arrangements of both the study and exhibition series, requiring the expenditure of much time and labor. This and the preliminary work of rendering the collection of bird skeletons accessible for study have consumed a great portion of the osteologist's time.

The specimens in the department of comparative anatomy have long been in confusion, and it has taken several weeks to arrange them temporarily. Before the close of another year it is hoped that the work of installation, if not completed, will be well advanced. Since the specimens added to the exhibition series are dwelt upon at some length in the report of the curator of comparative anatomy, it will be necessary in this connection only to acknowledge the valuable services of the assistant preparator, Mr. J. W. Scollick. The skeleton of Python in particular bears witness to his skill and patience.

The osteologists now have in use three tanks, thirty-five barrels, and six kegs, containing seventy-one skeletons and thirty-one skulls, a considerable number of skeletons being ready for maceration, but not placed in barrels owing to the impossibility of cleaning them during the present year. Two years ago the yard and shed, devoted to the cleaning of skeletons, were enlarged to three times their previous capacity, but now the working space has become greatly cramped and still further enlargement is extremely desirable.

(*c*) Modelers.

Mr. J. W. Hendley has been occupied in modeling and painting a large number of food specimens, and has repaired several lay figures. He has also made casts of numerous archæological and ethnological implements for the departments of pre-historic anthropology and ethnology.

Mr. Joseph Palmer has made casts of fishes and reptiles, and of several Indian heads and busts. He has also thoroughly cleaned and repaired the casts of seals, porpoises, and reptiles returned from the New Orleans Exposition.

(*d*) Photographer.

Mr. T. W. Smillie reports that during the year 617 negatives have been added to the permanent files, the greater portion of which were distributed as follows:

Ethnological and archæological, 359; lithological, 1; mineralogical, 74; ornithological, 3; metallurgical, 20; miscellaneous, 160.

Three thousand two hundred and nineteen prints were made, as follows: Ethnological and archæological, 1,317; mineralogical, 87; lithological, 1; ornithological, 3; metallurgical, 58; fishing vessels, etc., 232; miscellaneous, 1,521.

In addition, 770 blue prints and enlargements were made, as follows: Cyanotypes (plans of working drawings of Museum cases, etc.), 704; enlargements (medium size), 65; enlargements (4 feet by 7 feet), 1.

Eight pupils have been instructed in photography.

Every facility is afforded these students for acquiring sufficient knowledge of photography to be of practical use to them in the field. In addition to this, a large amount of routine work has been done, numbering and filing of negatives, making up outfits for expeditions, etc.

Negative paper has been adopted for field work, and in part the use of bromide paper for making enlargements.

The following apparatus has been purchased: Two Français lenses for field work, one roll-holder, one balance.

At the request of the Post-Office Department, Mr. Smillie was ordered, as an expert in testing inks, to test eleven cancelling and record inks for the Department. As none of the inks were indelible, a comparative test was made and a report on their relative values submitted. Upon this report was based a decision for making contracts for ink during the coming year.

(*e*) Artist.

Mr. A. Zeno Shindler has painted 218 casts of Indian heads and several casts showing the anatomical structure of fishes. He has retouched 27 Corean pictures, and has colored 33 photographs of machinery, Indians, etc. He has painted 110 casts of reptiles, mammals, fishes, mollusks, etc. He has also painted a collection of 23 Zuñi masks, and performed a considerable amount of additional incidental work.

(*f*) Preparator in the Department of Arts and Industries.

Mr. E. H. Hawley has continued his work of preparing specimens for exhibition. This work is varied in character, including the repair of musical instruments, the framing of pictures, the arrangement of fibers and cloths in frames, the mounting of photographs, the installation of costumes. Considerable time has been devoted to the preparation of the various Japanese collections for exhibition.

4. ACCESSIONS.

The number of boxes and packages received during the year was 6,890, including those which contained that portion of the objects exhibited at the New Orleans Exposition, which arrived in Washington after June 30, 1885. The number of accessions represented by these packages was 1,496 (Nos. 16207–17704).

The geographical sources of these accessions is shown in detail in the geographical index to the list of accessions in Part v of this Report. It is thought proper also to present in this place a running review of the most important of the general collections. Every State and Territory of the United States, excepting the Indian Territory, is represented in the list, and from the most of them have been received contributions to the departments of zoology, botany, mineralogy, and anthropology. Many of the accessions are small, consisting of a single object or of a few specimens.

GEOGRAPHICAL REVIEW OF THE ACCESSIONS.

AFRICA.

Several portions of this continent are represented in the Museum by small collections of material received from the New Orleans Exposition. These are principally ethnological, consisting of clothing, musical instruments, etc., and objects of art-work, such as carved brass trays, samples of leather-work, and stone carvings of Scarabeus. Twenty-three species of African mammals were received from the Museum of Comparative Zoology, Cambridge, Mass., and a few birds.

From Algeria we have five slabs of marble from the old Roman quarries, for many years lost sight of.

An Egyptian mummy* in excellent state of preservation and obtained at Luxor, in Upper Egypt, by Hon. S. S. Cox, United States minister to Turkey, was presented by him to the Museum.

This mummy measures 5 feet 6 inches, is delicately proportioned, and is altogether a very good specimen. No hieroglyphics or inscriptions have thus far been found, either on the mummy or on the outer case, which is also in a good state of preservation. The face and head of the mummy are covered by a mask of green cement, the part covering the face being gilded. A black streak one-half inch wide extends down the cheeks and across the chin, from eye to eye. Side by side on the chest lie four small tablets about the size of playing-cards, each one having upon it a mummied figure of Osiris in a standing position.

Two shield-shaped ornaments lie across the breast and stomach respectively; the upper one has upon it the sacred beetle with spread wings, beneath which is a Nilometer standing between the two figures which support a globe upon the head. The faces of the figures are covered by a square piece of gold-leaf; at the end of the wings is represented the hawk head of Ra, also supporting a globe. Over the surface of the shield are painted representations of jewelry. On the lower figure appears a kneeling figure of Nepte, with extended arms and wings. She wears a head-band upon her head, upon which rests a globe; on either side of the head of Nepte are two groups, each containing three small figures. Ostrich plumes appear in the corner of the shield. Along the leg of the mummy lies a sheet of linen, cemented (papier mâché) at the top of which is a mummy on a dog-shaped bier. At the head of the bier is a kneeling figure, holding an ostrich plume. Below this is a row of kneeling figures holding plumes. Further down is a second Nilometer, on either side of which a figure, with an implement in each hand, faces two mummied figures, both of which have the faces concealed with a square piece of gold-leaf. The feet are encased in a covering of cemented linen.

Lieut. M. A. Shufeldt, U. S. Navy, contributed a collection of shells from Madagascar.

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*Accession 17401. See Part V.

NORTH AMERICA.

BRITISH AMERICA.

Canada.—Among the objects received from the various provinces of Canada were bird-skins, minerals, ores, mammals, photographs of natural scenery, ethnological material, etc.

A large series of fossils, from the St. John group, was presented by Mr. W. B. Hamilton.

Mr. G. F. Matthews presented fifty-three specimens of Cambrian fossils from the St. John group.

UNITED STATES.

Alabama.—Interesting mineralogical and ethnological collections have been received from S. E. Johnson and Frank Burns, of the U. S. Geological Survey, as well as various ores and minerals sent for examination and report.

Alaska.—From Fort Alexander, Mr. J. W. Johnson, Signal Service observer, sent an important collection of bird-skins (one hundred and five specimens) including skins of the recently discovered *Plectrophenax hyperboreus*, also a collection of quaternary fossils in clay concretions, as well as stone implements and objects illustrating the domestic life of the Eskimo.

From Lieut. T. Dix Bolles, U. S. Navy, come an Eskimo mask, and various implements and carvings, taken from graves of Shuani in southeastern Alaska.

From Henry D. Woolfe, in charge of the coaling station at Cape Lisburne, Alaska, belonging to the Pacific Steam Whaling Company, have been received collections of great interest and of varied character, full lists being given in Part V; not the least interesting are the nests and eggs of several species of birds which breed in this remote locality.

Mr. Charles H. Townsend, an assistant of the U. S. Fish Commission, was sent to Alaska by the Commission to make some investigations into the fur-seal fisheries on the Pribyloff Islands, and during his stay, through the courtesy of Captain Healy, he accompanied the United States revenue steamer *Corwin* to Hotham Inlet. Thence in the steam-launch Mr. Townsend proceeded, under the guidance of Lieutenant Cantwell, to the mouth of the Kowak, and up the river to the head of navigation. On this occasion a large collection * of fishes, birds, mammals, and plants, together with a valuable series of ethnological objects, was secured.

The collection of birds is especially valuable, and among the rarest species may be mentioned: *Tringa damacensis*, an Asiatic sandpiper, new to the North American fauna; *Plectrophenax hyperboreus*, which was found breeding on Hall Island, in Bering Sea; a good series of the Una-

* Accession 16914.

lashka rock ptarmigan (*Lagopus rupestris nelsoni*), and a new species of Chickadee from the Kowak River, lately described as *Parus stoneyi*.

Dr. T. Hale Streets, assistant surgeon U. S. Navy, of the Coast Survey steamer *Carlisle Patterson*, sends collections of fishes and marine invertebrates from Alaska.

The latter are referred to at length in the report of the curator of marine inventebrates.

Mr. N. Grebnitzki, the Russian governor of Bering Island, has sent important zoological collections from the Bering and Commander Islands. These are referred to in the reports of the curators and in Part v. Especially noteworthy are the skeletons of a ziphoid whale, *Xiphius Grebnitskii*, and of the Northern mountain sheep, *Ovis nivicola*.*

Arkansas.—Dr. J. Guy Lewis, of Little Rock, gives a number of valuable minerals. C. F. Brown, of Hot Springs, also gives minerals; and W. W. Morrison sends a series of quartz crystals. In addition, various minerals and ores have been received for identification.

Arizona.—Maj. J. W. Powell, Director of the Bureau of Ethnology, has placed in the Museum a large collection of pottery, stone-perforators, grooved axes, mortars, pestles, grinding-stones, rubbing-stones, arrow-shaft straighteners, stone carvings, bone whistles, and paint-stones, obtained by Col. James Stevenson.

Mr. E. W. Nelson, formerly connected with the Museum, now living at Springerville, Arizona, has sent in interesting archæological specimens from the headwaters of the San Francisco River. These are described in the report of the curator of archæology.

Roswell Wheeler, jr., of Sacaton, has sent some rare birds' eggs.

Dr. B. J. D. Irwin contributed a skull of a bay lynx and also an Indian strainer used by Apache Indians in the preparation of "tiswin," an intoxicating drink made from the mescal plant.

A collection of seventy-five specimens of stone implements was obtained by purchase from J. H. Carlton, of Fort Thomas.

Maj. Anson Mills, U. S. Army, Tenth Cavalry, sends living specimens of the Gila monster, *Heloderma suspectum*.

California.—One of the most interesting contributions from this State was that sent by Lieut. P. H. Ray, U. S. Army, illustrative of the domestic arts and industries of the Indians of Hoopa Valley. This is the subject of a special illustrated paper by Professor Mason, and a descriptive list of the one hundred and twenty-six objects in this collection is given in Part v.†

Lieut. L. W. Green, of Baird, Cal., obtained a series of tools used by Shasta Indians in making bows and arrows, with specimens of their work.

C. B. Orcutt, of San Diego, sent fossil argonauta in indurated clay from southern California. A large number of horned lizards, *Phrynosoma coronatum*, was obtained by Miss Rosa Smith, of San Diego.

* Accession 16878. † Accession 17239.

Gustav Eisen, of Fresno, has sent interesting fishes and birds. C. H. Townsend contributed bones of whales and dolphins obtained at San Luis Obispo. Many zoological and mineralogical specimens were also received for identification.

Colorado.—Specimens of Zuneite were received from W. F. Hillebrand, of the U. S. Geological Survey, who also sent some examples of argyrodite, obtained from Himmelsfurst in Saxony, and from which was obtained the new metal Germanium. William F. Doty, of Durango, Dr. William Hall, of Central City, Louis R. Sharpe, of Leadville, O. H. Hahn, of South Pueblo, and others, send minerals and ores. H. A. Tamen, of Denver, presented his "Rocky Mountain Mineral Cabinet," containing some very interesting specimens.

James L. Foley presented a specimen of Williamson's white fish from White River, and a botanical specimen for identification.

Connecticut.—A. F. Wooster, of Norfolk, contributed brook trout, melanistic examples of star-nosed mole, Condylura, and the horned owl, *Bubo virginianus.* He also sent a stone ax, and a brass idol from Japan. Lewis B. Woodruff contributed bird skins and a number of sets of birds' eggs. E. B. Hodge, of Plymouth, N. H., sends a remarkable specimen of the brook-trout, *Salvelinus*, allied to the blue-blacked trout of northern New England, whose relations have not yet been thoroughly investigated.

From George W. Lendereg, of Roxbury, were received minerals.

Dakota.—From this State only minerals have been received, and from the following persons: R. E. Fleming, of Mandarin; H. I. Brown, of Ponca; S. H. Buchanan, of Custer City, and Samuel Scott, of Rapid City.

District of Columbia.—Capt. Thomas W. Symons, U. S. Army, assistant engineer of the District, gives a rock-drill of the kind used in the construction of the Washington aqueduct tunnel. George P. Merrill, of the National Museum, Prof. Thomas Robinson, of Howard University, and Dr. William S. McIlhenny, present minerals.

James Watson sent specimens of fossil wood from the reservoir cutting near Howard University.

T. E. Skinner and Clarence Burke send specimens of birds. Charles W. Richmond presented the nests of fourteen species of birds. Milton Smith gave a small mammal, and J. H. Kuehling, Charles A. Bruff, and H. W. Henshaw, of the U. S. Geological Survey, contributed serpents.

Florida.—Prof. O. P. Hay, of Indiana University, gave a collection of fishes. J. H. Batty and E. C. Greenwood presented a specimen of the young of the new sub-species of owl, *Syrnium nebulosum alleni*, a form new to the collection. Mr. Greenwood also sends several birds from the Thousand Islands. Dr. B. H. Warren, of West Chester, Pa., sent a collection of insects, mostly Diptera, and George W. Roberts, of the same place, contributed a collection of bird skins. Several desirable forms were purchased from C. J. Maynard, of Boston.

Charles T. Simpson sent a collection of marine shells, one hundred and eight species, and other similar contributions from Boca Ciega Bay were received from the U. S. Geological Survey.

From Dr. J. C. Neal, of Archer, was obtained a collection of fossils. He also sent some Indian beads from a mound.

John R. Jones, of Tampa, and Hon. W. H. Sebring contribute some invertebrates, and Mr. Joseph Wilcox, of Media, Pa., sends a very interesting collection of chipped-stone implements from the mouth of the Chesowishka River.

S. F. Walker, of Milton, and T. A. Britt, of Jacksonville, presented minerals.

Georgia.—Specimens of stalagmitic deposit containing bones of mammals from Todd's lime-kiln quarry near Cartersville, were presented by the U. S. Geological Survey. Fossil teeth of a horse and a skeleton of snake from the same locality were lent for examination by John P. Rogan.

From T. D. Perry, of Savannah, and W. B. Johnston, of Macon, were received zoological specimens.

Henry Weidenbach, of Washington, presented archæological objects from Fairfax County. Minerals and ores were sent by William Beal, of Murphy, N. C., N. P. Pratt, of Atlanta, and J. P. Elrod, of Jefferson.

Idaho.—From Francis Jefferey, of Ketchum, were received samples of the so-called American jute, proposed as a substitute for the jute of commerce. This is probably a species of rush, *Scirpus validus*.

Col. J. S. Shoup, of Salmon City, sends a large and valuable collection of ores of the Territory; and C. Overman, Joseph Hostetter, and T. J. Turpin, of Grangeville, send minerals.

From Capt. J. M. Lee, U. S. Army, of the Ninth Infantry, acting Indian agent at Darlington, were obtained two sets of bows and arrows from the Arapahoe and Cheyenne Indians. These form a very important addition to the collection.

Illinois.—During a vacation trip to Richmond County Mr. Robert Ridgway, curator of birds in the National Museum, obtained a valuable collection of birds, nests, and eggs. Zoological contributions were also made by J. Schneck, of Mount Carmel; J. P. Leach, of Rushville; John K. Walker, of Rushville; O. P. Rogers, of Marengo; E. B. Hoke, of Cordova, and H. G. Hodge, of York, who also sent an interesting collection of the fruits and woods of native trees.

C. Armstrong, of Carrollton, made an archæological contribution, and A. N. Abbott, of Union Grove, sent specimens illustrating the formation of fulgurites.

Indiana.—A large number of archæological objects obtained in this State were forwarded to the Museum, the most notable being those sent by J. R. Nissley, of Mansfield, Ohio; George Spangler, of Madison; George A. Becker, of South Bend; B. F. Stalker, of New Providence; A. C. Black, of Washington, D. C., and Dr. E. C. Black, of Wheatland.

Collections of a similar character were also received from Col. J. T. Abert, of the Engineer Corps, Washington, D. C., and from B. W. Evermann, of Indiana University.

Geological specimens were contributed by O. A. Blackman, N. W. Wood, and O. Whitcomb, of Leavenworth, and a collection of coal plants by Fletcher M. Noe, of Indianapolis. Some interesting fishes were sent by Prof. David S. Jordan, president of Indiana University.

Iowa.—J. W. Preston, of Baxter, and R. J. Haight, of Davenport, sent zoological specimens.

From the Charles City Marble Company was received a beautiful specimen of the so-called madrepore marble, a form of ornamental stone not hitherto known in the arts.

Kansas.—Reptiles from southern Kansas have been received from Charles Ruby, U. S. Army, stationed at Fort D. A. Russell, Wyo. Various zoological specimens have also been received from A. M. Fuller, of Lawrence; E. Bumgardner, of Holton, and Warren Kenaus, of Selina. Dr. W. S. Newlon, of Oswego, has sent mollusks from the Neosho River and neighboring streams for identification. From A. B. Baker, of Banner, Trego County, were purchased skeletons of the black-footed ferret, *Putorius nigripes*, one of the rarest of American mammals.

Dr. A. C. Peale, of the U. S. Geological Survey, sends an interesting contribution to the department of physical geology, and Dr. A. R. Chase, of Millwood, contributes bones and teeth of mastodon obtained at a depth of 30 feet below the surface. Fossil shells were sent by Robert Hay, of Junction City.

Kentucky.—Zoological specimens were presented by Mrs. Richard Carter, of Cloverport, and T. H. Morgan, of Lexington.

Prof. J. R. Procter, director of the Geological Survey of Kentucky, presents a large collection illustrating the coal formation of the State, including eight carefully prepared groups of specimens showing sections of different veins. Geological specimens were also received from M. E. Morgan, of Gratz. Kentucky Q. Smith (Gerard Fowke) sent two collections of archæological objects.

Louisiana.—C. J. Barrows, commissioner for Louisiana at the New Orleans Exposition, presented an exceedingly interesting collection of the clothing and weapons of the Shetimasha Indians, including several of their curious blow-pipes, used for the propulsion of arrows—the only weapons of the kind found among natives of North America; also samples of basketry from the Choctaw Indians; corn-husk basketry made by the negroes, and specimens of nankeen cotton and decorticated moss fabrics.

Minerals were received from S. H. Houston, of New Orleans. John M. Avery, of New Iberia, who has made many valuable contributions to the Museum from the salt works on the island of Petit Anse, presents beautiful specimens of salt illustrating cleavage.

Maine.—Samples of basketry from the Passamaquoddy Indians were received from Mrs. Fannie Pattangal, of Washington, D. C.

Mineral collections were contributed by George P. Merrill, of the National Museum; T. T. Lamb, of Portland; N. H. Berry, of South Paris; H. M. Meling, of Portland, and E. M. Bailey, of Andover.

William Herrick, of Swan's Island, contributed some fishes and sea-snails.

Maryland.—A large number of birds and other zoological specimens from various places in this State were sent by Dr. T. H. Bean, U. S. National Museum; George L. Meazell, of Middlebrook; John P. Hamlin, of Washington, D. C.; George Marshall, of Laurel; H. M. Smith, U. S. National Museum; L. M. Turner, Smithsonian Institution; J. D. Farden, of Washington; Gwynn Harris, of Washington, D. C., and J. H. Tolbert, of Havre de Grace.

Geological contributions were received from Michael Dooley, of Louaconing; Dr. F. M. Chatard, of Baltimore, and C. E. Coffin, of Muirkirk.

A collection of coins of the United States, Germany, Great Britain, and Ireland was obtained from Ralph Collier, of Laurel.

Massachusetts.—An exchange of rocks was effected by Mr. G. P. Merrill with Prof. W. O. Crosby, of Boston, and with Prof. B. K. Emerson, of Amherst. Mr. C. W. Chamberlain, of Boston; Mr. E. C. Greenwood, of Nantucket; and Mr. Willard Nye, jr., of New Bedford, contributed birds. Mr. J. Henry Blake, of Cambridge, sent parasitic copepods from Provincetown. From Captain Doane, Mr. Henry M. Low, of Rockport, and Mr. W. A. Wilcox, of Gloucester, were received fish. A grooved stone implement from Vineyard Haven was sent by Mr. Thomas Lee, of the U. S. Fish Commission. Specimens of feather-work, which had been exhibited at the New Orleans Exposition, were received from Milton J. Flood, of Sterling. Mr. William Brewster, of Cambridge, forwarded bird-skins for examination and report.

Michigan.—Geological specimens were received from F. W. Noble, of Detroit.

An interesting series of materia medica specimens was sent by Frederick Stearns & Co., of Detroit.

A. R. Dodge, of East Saginaw, presented a specimen of Ermine, *Putorius erminea*, in the flesh.

Minnesota.—A collection of minerals and rocks, exhibited at the New Orleans Exposition by the State of Minnesota, was afterwards presented to the National Museum by Prof. N. H. Winchell, of Saint Paul, who also sent a specimen of Duluth gabbro. From H. D. Gurney, of Saint Paul, were received samples of red granite.

Mississippi.—An interesting series of specimens illustrating negro manufacture, exhibited at the New Orleans Exposition, was presented by General Stephen D. Lee and Professor Phares.

A botanical contribution was received from Hon. James L. George, United States Senator.

Fossils from the Colorado group of the Cretaceous were sent by Miss May Halstead, of Lexington.

Harvey C. Medford, of Tupelo, sent minerals and fibers for examination; and S. S. Mitchell, of Columbus, presented samples of sandstone.

Missouri.—Zoological specimens were received from J. G. W. Steedman, of Saint Louis, and F. A. Lampson, of Sedalia.

Fossil shells were sent by Wiley Brittain, of Springfield.

A stone idol was transmitted by T. L. Whitehead, of Dexter, for examination.

B. A. Shepley, of Des Arc, gives mineral specimens.

Montana.—The most important contributions were made by Captain Chas. E. Bendire, who sent thirty-one bird-skins from Fort Custer, a revolver found on the site of the Custer massacre in 1876, and some interesting concretions.

Lead, silver, copper, and other ores were received from John S. Harris, of Helena; W. A. Clark, of Butte; F. J. Parker, of Washington, and Bush & Meyers, of Sheridan.

Nebraska.—Nothing of special importance was received. W. C. Knight, of Lincoln, sent a bird-skin. S. F. Fleharty, of Antelopeville, contributed fossil bones of horse, and Jerome Wiltse, of Falls City, sent an Indian implement.

Nevada.—A valuable collection of Trenton fossils (2,183 specimens) collected by C. D. Walcott, of which a full list is given in Part v under acc. 17447, has been received from the U. S. Geological Survey, and also specimens of silver ore from the Raymond and Ely mine at Pioche.

W. M. Havenor, acting commissioner for this State at the New Orleans Exposition, presented ores and mining pictures, and also an interesting series of implements, including a jug, basketry, and cradles, made by the Ute Indians.

Hon. R. W. Furnas, commissioner for Nevada at the New Orleans Exposition, sent plants.

New Hampshire.—From C. H. Hitchcock, of Hanover, comes a large collection of rocks, and also a vertical column of slate, showing the relative age and comparative thickness of the Archæan, Cambrian, and Silurian formations.

Fishes were received from E. P. Hodge, of Plymouth, and I. P. Miller, of Portsmouth.

W. H. Fox, of Washington, contributed several specimens of birds.

New Jersey.—An extensive collection of carboniferous fossils, made by C. D. Walcott, numbering three hundred and eighteen specimens, was received from the U. S. Geological Survey.

Zoological specimens were obtained from J. M. C. Eaton, of Irvington, and W. L. Green, keeper of Long Branch life-saving station.

From C. I. Grimm, of Loveladies Island, was obtained a whale, *Kogia breviceps.*

The Pennsylvania Railroad Company, through J. E. Watkins, honorary curator of steam transportation in the National Museum, presented drawings, sections of iron rails, castings, etc.

Mineralogical material came from Prof. George J. Cook, of New Brunswick, from the Bloomingdale Graphite Company, and from George P. Merrill, of the National Museum.

Ten argillite implements, found by Dr. C. C. Abbott in a gravel bed at Trenton, were presented by Dr. Charles Rau, curator of archæology in the National Museum.

New Mexico.—Dr. R. W. Shufeldt, U. S. Army, stationed at Fort Wingate, has made very extensive gifts to the departments of mammals, birds, and reptiles.

Mr. J. B. Bowman, of Aleman, has sent numerous birds.

The geological departments in the Museum have been enriched with one hundred and eight specimens of turquois from the U. S. Geological Survey; silver and iron ores from Professor Spatcier, of Las Cruces; obsidian from the commissioner of New Mexico at the New Orleans Exposition, and meteoric iron from Albuquerque, sent by L. G. Eakins, of Denver, Colo. Fred W. Taylor, of Lake Valley, sent pressed sulphide of silver, in the form in which silver is recovered from the leeching solution.

New York.—Zoological contributions were made by Dr. C. S. McKnight, of Saranac Lake; Dwight D. Stone, of New York; S. E. Meek, of Cayuga; James T. Walker, of Palmyra; A. G. Cheney, of Glens Falls; F. C. Jessup, keeper of Petunk Life-Saving Station; and Mrs. F. L. Lee, of Westport.

Ores and minerals were received from Charles Miller, of Sanborn, who also sent fossil shells; L. W. Ledyard, Cazenovia; and George W. Watkins. Miss Mary E. Mann sent samples of deposit from Geyser Springs, Saratoga.

Fossil plants from Allegany County were received from William H. Dall. R. E. C. Stearns also sent fossils.

A necklace of wampum beads, representing the work of the Mohawk Indians, was presented by Prof. Otis T. Mason.

A remarkable stone carving, representing a human head, was given by the Natural Science Association of Staten Island.

North Carolina.—Zoological specimens were sent by Dr. H. C. Yarrow, U. S. Army, honorary curator of the department of reptiles; William Brewster, of Cambridge, Mass., and Mrs. H. K. Morrison, of Morgantown. The Wilmington Oil and Leather Company presented skulls of a porpoise, *Tursiops tursio.*

Ores of various kinds were received from C. H. Waring, of Knoxville, Tenn.; Col. P. M. Wilson, of Raleigh; S. M. Dugger, of Banner's Elk, and Robert Claywell, of Morgantown.

Indian implements were contributed by Dr. J. M. Spainhour, of Lenoir; J. C. Russell, of Richmond, Va., presented a "puller," an implement used (in North Carolina) for chopping pine trees.

Ohio.—William Kayser, of Wapakoneta, sent some phyllopod crustaceans. John S. Pollock, of the Smithsonian Institution, presented a

box tortoise, *Cistudo carolina*. Specimens of moths, etc., were sent for examination.

The archæological accessions were among the most important from this State. T. F. Spangler sent flint implements. H. C. Duvall, of Washington, sent a pierced tablet. Ceremonial and other objects were received from Dr. L. B. Welch, of Wilmington, and from Kentucky Q. Smith.

Oregon.—Ores and minerals were received from J. C. Swash, of Union; Allen D. Wolcott, of Randolph; and F. J. Parker, of Washington, D. C.

William H. Dall presented a cap and woven basket made by the Rogue Indians.

A collection of fossils for examination and report was forwarded by H. E. Dore, of Portland.

Pennsylvania.—Zoological contributions came from S. M. Sener, of Lancaster; F. G. Galbraith, of Wrightville; Dr. A. Van Cleef, of Scranton, who also sent samples of coal formation; and George W. Roberts, of West Chester.

Several important lots of geological material were received, notably, from Joseph W. Wilcox, of Media; Capt. John J. Williams, of Thurslow; H. M. Ingram, of the National Museum; R. P. Janus, of Washington; and Henry J. Biddle.

Interesting archæological objects came from Dr. T. H. Bean, of the National Museum; A. F. Wooster, of Norfolk, Conn.; and A. F. Berlin, of Allentown.

A box of invertebrate fossils was sent by R. P. Sharpless, of Phœnixville.

John W. Brock sent specimens of fossil corn from the slope of the mine of the Lehigh Coal and Navigation Company.

George W. Snyder, of Somerset, sent a collection of Pennsylvania State-bank bills.

Rhode Island.—Joseph Wharton, of Newport, and E. G. Blackford, of Fulton Market, New York, sent fishes, and H. C. Bumpus, of Providence, presented reptiles.

The Newport Natural History Society sent mortar from an old tower at Newport.

South Carolina.—Arthur T. Wayne, of Charleston, sent a specimen of Swainson's Warbler, *Helinaia swainsoni*, with nest and eggs.

Geological material was sent by W. F. Chaplin and F. A. Scheffler, of Orangeburgh, for examination and report.

The U. S. Geological Survey, through Frank Burns, sent fossil wood and berries; also bricks from a corner-stone of the old court-house in Orangeburgh, and two mullers.

Tennessee.—Ornithological specimens were sent by James W. Rogan, of Rogersville. R. Ellsworth Call presents mollusks.

Ores and minerals were received from the U. S. Geological Survey; William Beall, of Murphy; A. J. McWhirter, of Nashville; C. H. War-

ing, of Knoxville; C. C. Hoffmeister, of Mossy Creek; and Dr. J. Berrein Lindsley.

C. D. Walcott and Frank Burns, of the U. S. Geological Survey, presented fossils; and James W. Rogan, of Rogersville, and John T. Irwin, of Paris, sent botanical specimens.

Texas.—Zoological specimens from this State were received from Thomas McIlwraith, of Hamilton, Ontario, Canada, and Col. A. G. Brackett, U. S. Army, of Fort Davis.

Geological material was sent by W. H. Stephens, of Hiner; D. H. Gibson, of Mineral Wells; Larkin King, of San Saba, and Dr. G. P. Hachenberg, of Austin.

An interesting leaf-shaped implement of brown jasper, from the Chenote Mountains, was presented by Thomas R. Stewart, of Presidio.

Fossils were transmitted by Capt. W. H. Clapp, U. S. Army, of Fort Stockton, and botanical specimens by Dr. W. Thornton Parker, of Newport, R. I.

Utah.—An interesting series of thirty-one articles collected by Dr. H. C. Yarrow, U. S. Army, among the Gosh Utes, was added to the ethnological collection. This consisted of baskets, berry-wands, moccasins, basket-hat, water-jars, doll, leather bag, and cradle-back.

Fossil plants from Wales, collected by Dr. C. A. White, were presented by the U. S. Geological Survey.

Several geological specimens were forwarded for examination and report.

Vermont.—Geological material was sent for examination and report.

Virginia.—Forty-two accessions of various kinds were received from this State.

From the Wytheville hatchery of the U. S. Fish Commission come specimens of California Mountain Trout and Penobscot Salmon. Col. Marshall McDonald sent several large and varied collections of fishes, insects, mollusks, invertebrates, reptiles, and two mammals. Other contributions of fishes were received from James Godden, Maurice Cropley, who also sent a star-fish, *Asterias forbesii*, Gwynn Harris, of Washington, W. Yeatman, keeper of the light-house at Point Lookout, Md., and Thomas Lewis, of Roanoke. Lucien M. Turner, William Palmer, of the National Museum, and H. P. Hoare, of Phœbus, sent reptiles. Birds were presented by John Dowell, of Washington, James Deane, of Alexandria, and Russell Robinson, of Richmond. Robert Ridgway, of the National Museum, contributed a nest of the Blue Grosbeak, *Guiraca cærulea.* Howard Shriver, of Wytheville, Frank P. Gold, of Rest, and John S. Webb, of Totaro, sent insects. Prof. I. H. Morrison, of Lexington, contributed specimens of snail-shell, *Helix hortensis.* This locality is new for this species. A. B. Johnson, of the Light-House Board, sent a section of a pile from a wharf at Cape Henry, completely riddled by the boring of the ship-worm, *Teredo navalis.*

Fossil coal, from the Piedmont district, was received from Court Hamilton, of Bunker Hill, W. Va.

An interesting collection of minerals, numbering one hundred and thirty-eight specimens, came from Prof. M. B. Hardin, of the Virginia Military Institute at Lexington. Minerals were also received from Myron B. W. Hough, of Washington, F. W. True, of the National Museum, D. W. M. Wright, of Holly Brook, J. H. Brumwell, of Roanoke, and J. H. Mitchell, of Philadelphia. Henry Horan, of the National Museum, gave a specimen of stalagmitic marble from the Luray Cave.

H. M. Smith, of the National Museum, presented canister shot and minie-balls from the battle-field of Bull Run, and Capt. C. W. Dunnington, of the National Museum, added to the historical collection a military pass to Fredericksburgh, dated September 2, 1861, and signed by John Letcher, governor of Virginia.

Washington Territory.—Zoological specimens were received from Lieut. H. E. Nichols, U. S. Navy, R. D. Nevins, of Olympia, and Dr. Basil Norris, U. S. Army. James G. Swan forwarded mollusks and marine invertebrates from Cape Flattery, and a sample of parchment composed of kelp, and prepared for printing.

John W. McGee, of Seattle, John J. Burns, of Sprague, and I. A. Crawford, of Spokane Falls, forwarded minerals and ores. Similar material for examination and report was also received from several individuals.

West Virginia.—Specimens of *Micropterus dolomieu* and *Ambloplites rupestris* from Fairmount were collected by the Fish Commission.

Geological material was presented by Maj. Jed. Hotchkiss, of Staunton Va., Frank Smith, of Cincinnati, Ohio, and Timothy Nihon, of Hedgesville. Minerals and ores were sent for examination and report.

Wisconsin.—A collection of three hundred and thirty-nine Trenton fossils was given by H. C. Powers, of Beloit.

J. L. De Witt, of Newton, presented two drilled bear's teeth, two bone ornaments, two small sheets of native silver, shaped by beating, and six cylindrical copper beads from a mound at Warner's Landing. The sheets of silver are of special interest, and are the first specimens of the kind in the possession of the Museum.

Wyoming.—Insects were received from N. H. Brown, of Lander, and mammals from Charles Ruby, U. S. Army, stationed at Fort D. A. Russell.

CENTRAL AMERICA.

From the Central American states were received minerals, bird skins, insects, etc.

Mr. Harry Stewart, of Nicaragua, contributed two ancient iron stirrups, and a number of wooden crosses obtained in an ancient graveyard.

From Nicaragua were also received a plow and yoke, and a collection of ethnological objects, pottery, etc.

From Yucatan a collection of one hundred and thirteen bird skins, including a new species, was sent by George F. Gaumer.

Specimens of reptiles and insects were received from Panama.

MEXICO.

Mr. Louis H. Aymé forwarded ethnological material, stone carvings, and pottery, as the results of his investigations in Yucatan and Mexico.

From Mr. E. Wilkinson was received a collection of reptiles embracing four hundred and seventy-one specimens, and also two mammal skins.

Prof. Alfred Dugès transmitted several collections of objects of natural history, including mammals, bird skins, reptiles, ores, insects, and plants.

The commission representing the Mexican Government at the New Orleans Exposition transferred to the Museum a large collection of gums, dyes, foods, animal products, ores, baskets, textiles, etc.

Hon. Warner P. Sutton, United States consul, contributed two stone mortars and a musical instrument.

From the Mexican Geographical and Exploring Commission was received an interesting series of ninety-five specimens (fifty-nine species) of bird skins. This contribution formed a part of the Mexican Government exhibit at New Orleans, and contains five species new to the Museum collection.

Specimens of gold, silver, and copper ores were received from several of the Mexican States.

WEST INDIES.

Mrs. C. H. Dall contributed a collection of fifty specimens, fifteen species, of marine shells.

The U. S. Fish Commission steamer *Albatross*, in a cruise among the Bermuda and Bahama Islands, secured nine hundred and fifty specimens of bird skins, and also a number of archæological implements, etc., including polished celts, chisels, rubbing-stones, and pendants.

The natural history of the islands is represented by numerous contributions of mollusca, marine invertebrates, reptiles, insects, mammals, fishes, birds, etc.

From other contributors, minerals, crustacea, fishes, materia medica, and reptiles were received.

Professor Poey sent specimens of Cuban fishes.

SOUTH AMERICA.

From Brazil were received a series of fibers and also a collection of the various woods of that country.

A collection of thirteen reptiles from Ecuador was presented.

From Venezuela a collection of bird skins, including twenty-one specimens, thirteen species; also a small collection of bird skins from

Brazil and Peru, and a few specimens of birds, mammals, seed, and a fish-trap used by the natives of Venezuela.

ASIA.

Commodore R. W. Shufeldt, U. S. Navy, presented a Damascus sword and eight knives mounted in ivory and gold, of Arab manufacture, from Muscat, given to him by the Sultan of Zanzibar. N. Carandonis deposited a Grecian bowl from an Ephesian tomb, and an ancient costume found in a cavern at the castle on the island of Calumnos. Mr. Otis Bigelow presents a considerable collection of ethnological objects from Egypt and the Holy Land. Other objects of similar character were received from the Department of State after the close of the New Orleans Exposition, as was also an important collection of minerals from Teheran, Persia.

Mr. William H. Dall presents a model of a Madras catamaran, obtained by Rev. C. H. A. Dall, and other articles from India. Mr. A. G. Studer, U. S. consul at Singapore, sent through the State Department the implements and materials used by those who chew the betel-nut, and also a collection of the native woods of Singapore.

Various single objects and small collections, ethnological and zoological, from other portions of the East Indies, were received from different individuals.

From China the accessions were for the most part obtained through the State Department after the close of the New Orleans Exposition, and included a number of interesting products of the native arts, and a series of specimens illustrating the ramie industry of that country. Dr. Bethune McCarthy, for nearly half a century a medical missionary in China and Japan, has given and deposited a small but very useful and interesting collection of books, pictures, and other objects.

From Corea, Ensign J. B. Bernadou, U. S. Navy, obtained a large and valuable collection, including fishes, marine invertebrates, cephalopods, pottery, ethnological material, and drugs. Some of the pottery in this collection is said to be from three hundred to seven hundred years old.

In addition to this collection three specimens of lacquered ware—cup, can, and tube—which were exhibited at the New Orleans Exposition, were added to the ethnological collection.

From Japan was received a collection of minerals presented by General Thomas B. Van Buren, U. S. consul at Kanagawa.

A very beautiful helmet of silver, with bosses of steel and with leather cape, lined with embroidered silk, was presented by D. W. Zantzinger, of Washington.

An interesting series of bird-skins from Japan was given by Henry Seebohm, of London, besides various smaller collections. The most important of all the accessions from Japan was a most instructive series of ninety-two specimens, illustrating the manufacture of pottery and porcelain, showing the materials, appliances, the objects in various

stages of manufacture, and the final products. This, together with a detailed catalogue, was sent by the Department of Education in Tokyo, and is referred to at length in Part V, under accession 17339.

EUROPE.

AUSTRIA.

The Austrian exhibit at the New Orleans Exposition, consisting of textile goods, dried fungi (one hundred specimens), grains, foods, and musical instruments, was transferred to the National Museum.

BELGIUM.

Eleven geological maps were received from the Belgian Commission at the New Orleans Exhibition.

ENGLAND.

A most interesting addition was an "exchequer tally" presented by A. W. Franks, esq., of the British Museum, and referred to in Part V, under accession 66213.

This was used by the court of exchequer of England as a record of and receipt for money loaned to or by the Government. Tally sticks circulated as money in England in 1697. The tally now presented is for £100,000, in part principal of the loan of £1,400,000 from Government, and for £6,049 6*s*. 3*d*. for interest thereon, due September 30, 1776. Paid November 28, 1776.*

* The Saxon kings of England kept the record of their public accounts on notched sticks, and the same system of registering loans was practised by the Court of Exchequer until the year 1783, when by Act of Parliament, under George III, a new method was adopted.

A supply of hazel, ash, or willow sticks was kept for the use of the Treasury; when seasoned and prepared, notches were made on one side by the cutter of tallies, and Roman numerals were inscribed on the opposite side by the writer of tallies. The notches were made of different sizes to represent pounds, shillings, pence, and a hundred or even a thousand pounds. The stick was then split through the center by the Deputy Chamberlain, with a knife and mallet; one portion being called a tally, or the scacha, stipes, or kancia, and the other portion the counter-tally, or folium. The date of the deposit or credit and that when payment would fall due, and the name of the person having the claim upon the Treasury was also inscribed upon the tally. When payment was due, the counter-tally was presented at the Treasury, and, if it fitted with the tally the money was paid, and the two parts put together and filed away as a permanent record of settlement.

In 1697, while the metallic currency of England was being recoined, there was a great scarcity of currency, and exchequer tally sticks were put in general circulation as money. The regular currency, also the exchequer tallies, depreciated greatly. The Bank of England advertised a new loan of £1,000,000, offering to take 80 per cent. of the same in tally sticks, and this relieved the Government of £800,000 outstanding promises to pay, which became due the Bank, an easy creditor of the King.

In 1834, by order of Parliament, the great quantity of tallies which had accumulated in hundreds of years were burned in the stoves at the House of Lords, and, unfortunately, the great heat set fire to the building and consumed the Houses of Parliament, October 16, 1834.

Several large collections of pottery, exhibited at New Orleans, were afterwards sent to the Museum.

Mr. Edward Hargitt contributed bird skins.

By exchange with R. Bowdler Sharpe, esq., of London, the Museum has obtained three hundred and twelve specimens (one hundred and forty-nine species) of birds, chiefly new to the collection, and for the most part from Turkey, France, South Africa, Asia Minor, India, England, Malay Peninsula, Borneo, Pegu, British Burmah, Timor Laut, Papua, Australia, Brazil, and Peru.

Minerals, fishes, and materia medica specimens also added to the Museum collections.

FRANCE.

Mr. Thomas Wilson, United States consul at Nice, France, forwarded a collection of prehistoric stone implements.

Collections of bird skins, fibers, and two mammals were received.

Two manikins of Africans and one of an Arab Sheikh were prepared for the Museum by M. Jules Hébert, under the supervision of the director of the Trocadero Museum, Paris.

GERMANY.

From E. Rey a collection of bird skins was purchased.

The following material, forming part of the German exhibit at New Orleans, was received: a collection of baskets and other industrial products, and two figures illustrating dress and occupation of peasants.

HOLLAND.

Four large pieces of Flemish tapestry* (Acc. 16707) have been deposited by Lieut. Gen. P. H. Sheridan, U. S. Army. These are four of a series of six pieces illustrating scenes in the life of Alexander the Great, made by Jan Leyniers (1627–1686) from designs by artists of the school of Rubens, and presented by John W. Mackay to General P. H. Sheridan.

The legends are translated as follows:

1. Alexander kills a lion with a severe wound.
2. Alexander draws up the line of battle and exhorts his men to fight.
3. To Alexander, on account of his victories in divers places, arms are surrendered and he is adored as a god by his men.
4. Alexander covered with dust and sweat, bathing himself in the river Cydnus, is taken out thence like one breathing his last.

Through the New Orleans Exposition was received a collection of industrial products.

IRELAND.

Four specimens of basalt, box of magnesia, and a specimen of lace were received.

* Size 14 feet by 13 feet 3½ inches.

ITALY.

Among the accessions from this country were a collection of ancient Roman coins, blocks of lava from Vesuvius, eight specimens of cinnabar, and fourteen specimens of sulphur, and ores.

NORWAY.

Several domestic utensils and a collection of marine shells (thirty species) were received.

RUSSIA.

A collection of reptiles, and a collection of leather and cotton fabrics.

SAXONY.

A collection of majolica-ware and china.

SCOTLAND.

Specimens of cotton and worsted fabrics.

SWEDEN.

A Chukchee cross-bow, an assortment of seeds from the Experimental Gardens, and a few specimens of ores were contributed.

OCEANICA.

A collection of textiles, mammal skins, bird skins, botanical specimens, nuggets, and a fossil plant were received from Australia, and a collection of nine mammal skins from New South Wales and Tasmania.

From New Zealand, a necklace and a wallet made of seeds from Papua and Samoan Islands, specimens of bird skins, and a collection of twenty-three mammal skins from Queensland and Tasmania were received.

From the Samoan Islands comes a Kava bowl, cocoanut-shell cup, and root used in preparing a drink called "Kava," together with some specimens of Tapa cloth and a rug.

A few mammal skins, five carved gourds, and specimens of sugars were sent from the Sandwich Islands.

A collection of mollusks and marine invertebrates was obtained by the U. S. S. *Enterprise* in the islands of the South Pacific.

5. CO-OPERATION OF THE DEPARTMENTS AND BUREAUS OF THE GOVERNMENT.

As in previous years, the National Museum has enjoyed the valuable co-operation of the various Departments of the Government.

A number of collections have been received from various agents employed by the Departments at home and abroad, who during time not occupied in official duties have employed themselves in scientific investigations and in collecting material for the Smithsonian Institution.

President Cleveland presented a bowl, cocoanut-shell drinking cup, used in the ceremony of kava drinking, and a fan, two pieces of the root from which the "kava" is made; and also a rug of native manufacture. These objects were presented to the President by the King of the Samoan Islands.

STATE DEPARTMENT.

The material received through this Department was collected by the United States consuls in various foreign countries. The contributions here mentioned do not include the material received from the New Orleans Exposition through this Department.

Hon. S. S. Cox, U. S. minister to Turkey, sent an Egyptian mummy. This specimen is fully described on p. 150 of this report.

Hon. G. W. Griffin, U. S. consul, Sydney, Australia, forwarded Australian wool.

Hon. Otto Reimer, U. S. consul, Santiago de Cuba, sent some minerals, among which was a very interesting variety of garnet.

Hon. Edward Thompson, U. S. consul, Merida, Yucatan, sent a bird skin.

Hon. Albert Woodcock, U. S. consul, Catania, Sicily, sent a plow, which is of great interest, from the fact of its being similar to those used in Sicily more than two thousand years ago.

Samples of Russian petroleum refined at Marseilles, and of milk sugar from Germany and Switzerland, were also received.

TREASURY DEPARTMENT.

Bureau of Engraving and Printing.—A small collection of materials illustrative of the engraver's work was received.

U. S. Coast Survey.—Dr. W. H. Rush, of the steamer *Blake*, sent a collection of mollusks from the Gulf of Mexico, and a parasite worm taken from a rock cod. A case of salinometers and an optical densimeter were deposited by this Bureau.

Light-House Board.—A series of models of light-houses, light-ships, etc., which were exhibited at the New Orleans Exposition, were placed on deposit.

U. S. Revenue Marine.—Capt. M. A. Healy, of the steamer *Corwin*, sent a collection of fishes, marine invertebrates, etc.

WAR DEPARTMENT.

Lieut. Gen. P. H. Sheridan, lent, for exhibition, four large specimens of Flemish tapestry. These represent scenes in the life of Alexander the Great, and are described on page 65 of this report.

Capt. Charles E. Bendire, honorary curator of birds' eggs in the National Museum, contributed during the year a collection of fishes, birds, birds' eggs, reptiles, and three concretions from near Fort Custer, Mont., a Smith & Wesson revolver found on the Custer battle-field in 1883, and a bird from Fort Lowell, Ariz.

Col. A. G. Brackett, of Fort Davis, Tex., sent a nocturnal hawk-moth.

Dr. J. C. Merrill, of Columbus Barracks, Ohio, sent a nest and eggs of Acadian fly-catchers.

Lieut. P. H. Ray, Fort Gaston, Cal., gathered a large and valuable collection of ethnological objects used by the Hoopa Natano and Klamath Kenuck bands of Indians in California.

Dr. Samuel Q. Robinson, U. S. Army, sent an American Egret.

Charles Ruby, U. S. Army, of Fort D. A. Russell, Wyoming, contributed the following specimens: Indian saddle, axolotl, necks and tongues of two horned owls, gopher skins, and spermophiles.

Dr. R. W. Shufeldt, U. S. Army, of Fort Wingate, N. Mex., has continued his valuable assistance to the Museum, and has sent large collections of birds, reptiles, insects, mammals, etc.

From the Surgeon-General of the Army was received a collection of 513 crania and 322 skeletons, which were eliminated from the collections of the Army Medical Museum during its reorganization. Many of these were improperly mounted, however, and not of sufficient value to be placed in the exhibition series, and are useful only for purposes of study.

U. S. Signal Service.—General A. W. Greely contributed some bones of Atlantic walrus and Polar bear, obtained by him while in the Arctic regions.

J. W. Johnson, of Fort Alexander, Alaska, sent a collection of ethnological objects, fossils, shells, stone implements, and bird skins.

NAVY DEPARTMENT.

Ensign J. B. Bernadou, U. S. Navy, while stationed in Corea, forforwarded a valuable collection of Corean material, including table-ware, bottles, water jars, wine-cups, drugs, musical instruments, fabrics, fishes, turtles, marine invertebrates, cephalopods, ethnological objects, etc.

Lieut. T. Dix Bolles, stationed in Alaska, contributed a wooden mask, war knife, and a pipe taken from the Indian graves in southeastern Alaska.

Dr. J. T. Bransford, while in Nicaragua, forwarded a collection of the fishes, reptiles, and birds of that country.

Dr. W. H. Jones sent a collection of fishes, insects, and a water-snake from Panama.

Admiral J. E. Jouett contributed an agouti from Central America.

Lieut. W. A. Mintzer donated several Corean coins.

Lieut. H. E. Nichols sent from Sitka, Alaska, a collection of alligator fishes.

Commodore R. W. Shufeldt contributed a Damascus sword and eight small ivory and gold-mounted knives of Arabian manufacture.

Dr. T. H. Streets, passed assistant surgeon, contributed a collection of fishes, shell, reptiles, marine invertebrates, etc.

Bureau of Navigation.—A collection of marine invertebrates made by the U. S. steamer *Enterprise*, in the South Pacific and Atlantic Oceans, was transferred to the Museum.

INTERIOR DEPARTMENT.

U. S. General Land Office.—A large collection of minerals, ores, and building stones, exhibited by this office at the New Orleans Exposition, was, at the close of the exposition, transferred to the Museum.

U. S. Geological Survey.—Numerous collections, large and small, were received from the U. S. Survey, among which were the following: Minerals and rocks from California, Kentucky, New Mexico, North Carolina, and Alabama; silver ore from Nevada; a large collection of plants from the Yellowstone National Park; birds' nests from Virginia; natural coke, furnace slag, reptiles; marine shells from Florida; fossil wood and berries, and relics from Orangeburgh, S. C.; stalagmite deposit, containing bones of animals, from Cartersville, Ga., and collections of Trenton, Devonian, Carboniferous, Silurian, and Ordovician fossils.

There was also received a series of geological relief maps of Mount Taylor, New Mexico; Washoe district, Nevada; Uinta and Wasatch Mountains; Eureka district, Nevada; Leadville and vicinity; high plateaus of Utah; Elk Mountains (colored); Ruby Hill Mines, Nevada (model); Leadville (dissected); Henry Mountains, Utah. Topographical models of the Yosemite Valley, Yellowstone National Park, ancient province of Tusayan. Models of the following mounds: Great Serpent; section of Little Etowah; Pit of Nelson; Great Etowah; Linn, and Great Elephant, five cliff ruin models and seven pueblo models.

BUREAU OF ETHNOLOGY.

From the Bureau of Ethnology were received a model of Wejegi, one of the Chaco ruins, prepared under the direction of the Bureau, and seventeen photographs of Osage and Ute Indians; life-size busts of "Prairie Chicken" and "Little Wolf," and some Zuñi gods. Twenty-two boxes of pottery, baskets, and blankets were also transmitted to the Museum.

GOVERNMENT ASYLUM FOR THE INSANE.

Dr. W. W. Godding, Superintendent, sent a black bear.

U. S. FISH COMMISSION.

The material received from the Fish Commission consisted of collections of fishes, marine invertebrates, mollusks, reptiles, birds, mammals, insects, oysters, porpoises, stone implements, bones, birds' nests and eggs, rushes, etc. Mr. James E. Benedict, of the Fish Commission, sent a carrying basket, obtained by him on Cozumel Island, and a water-vessel from Old Providence Island. Col. Marshall McDonald sent several large collections of fishes, reptiles, crayfishes, insects, fungi, marine

invertebrates, etc. Mr. C. H. Townsend sent from California a collection of birds, mammal skins, and fishes, and from Alaska a skin canoe, fossil shells, actinians, bird skeletons, mammals, birds, etc.

6. REPORT UPON THE EXHIBIT MADE BY THE SMITHSONIAN INSTITUTION AT THE NEW ORLEANS EXPOSITION.

BY R. EDWARD EARLL.

In accordance with an executive order of May 13, 1884, there was organized a Board of Government Commissioners charged with making the necessary arrangements for a general Government display at three exhibitions, namely, the Southern Exposition at Louisville, Ky., opening August 16 and continuing until October 25; the Cincinnati Industrial Exposition to be held at Cincinnati, Ohio, between September 3 and October 4; and the World's Industrial and Cotton Centennial Exposition at New Orleans, beginning December 16, 1884, and continuing till May 31, 1885. The board consisted of one representative from each of the Government Departments; and, in addition, a representative from the Smithsonian Institution, including the U. S. National Museum and the U. S. Fish Commission; and one from the Department of Agriculture.

To this board were referred all questions relating to the participation by the Government in the various exhibitions. Each Representative was charged with the preparation of an exhibit for the Department with which he was connected, and the funds placed to its credit by Congress were to be disbursed under his direction. Prof. G. Brown Goode, Assistant Secretary of the Smithsonian Institution, in charge of the U. S. National Museum, who had represented the U. S. Fish Commission at the Fisheries Exhibition at Berlin in 1880, and that at London in 1883, was nominated by Professor Baird, to represent the three organizations above named, and a day or two later he received an official appointment from the President of the United States. The board held an informal conference in Washington, beginning May 7, for the purpose of drawing up an outline of the work in connection with the several expositions, and for submitting estimates of the amount of money required by each Department for preparing a satisfactory exhibit. The passage of the bill authorizing the expenditure of money in connection with these exhibitions was considerably delayed, and the funds did not become available until July 7. At this time there were placed to the credit of the Smithsonian Institution $75,000 for the preparation of exhibits for the exposition at New Orleans, with $2,500 additional for Louisville and $2,300 for Cincinnati. Only a few weeks remained before the opening of the two last-named exhibitions, and the exhibit for each of these, owing to the limited time remaining, was necessarily less complete than it would otherwise have been; though the work was pushed vigorously, beginning immediately after the appropriations became available, and continuing till a few days before the opening of

the exhibitions, when the exhibits were shipped and officers of the Museum proceeded to the respective cities to see to the proper installation of the collections.

THE EXHIBIT AT LOUISVILLE.

In 1883 the people of Louisville obtained control of a large plat of ground within easy access of the city and erected a building 920 feet by 630 feet, with extensive galleries, where they held a large and successful exposition, continuing for three months. The exposition of 1884 was held under the same auspices and in the same building, opening August 16 and closing October 25.

Immediately upon the passage of the bill by Congress, correspondence was opened with the management of the exposition, and space obtained in different portions of the building for the several Executive Departments, 4,500 feet being assigned to the Smithsonian Institution, in one of the most prominent locations. The time being short, the work of preparing the exhibit was vigorously prosecuted, and on August 12 three cars, containing ninety-five cases, with a weight of 23,553 pounds, were shipped. These arrived at Louisville on the morning of the 16th, and by the evening of the 19th were fully installed.

The industrial interests of Kentucky were taken into consideration in deciding upon the character of the exhibit, which it was thought desirable to make as instructive as possible. It was largely an educational exhibit, showing the processes of manufacture of raw materials which are abundant in the State, to which were added specimens illustrating certain subjects which it was thought would prove both novel and interesting to the people of Kentucky. One of the prominent features of the exhibit was a large collection showing the process of manufacturing textiles from raw materials, including flax, hemp, jute, grasses, and silk. A collection illustrative of articles derived from the animal kingdom was also shown. This included a series of furs, another of crude and manufactured leathers, a third of natural and ornamental shells and shell-work, a fourth illustrating the uses of feathers in the arts, and a fifth showing the manufacture and uses of glues derived from the sounds, bones, and skins of various species of fish. An extensive collection of photographs and drawings, illustrative of the great ocean fisheries of the New England coast, was also shown. The whale fishery was illustrated by means of a full-sized whale-boat, fully equipped with sails, oars, harpoons, lines, and guns; also by a model of a whale-ship with a whale alongside, showing the method of stripping the blubber and trying it out on the vessel's deck; and by paintings of whaling scenes. The other fisheries, including those for cod, mackerel, menhaden, and herring, and the apparatus and methods of fish-culture, were fully shown by models of the most important vessels and boats, and by a series of photographs, 30 by 40 inches, neatly framed, and mounted on screens. The natural history collections included

representations of nearly all of the snakes and reptiles found in the United States, and a fine series of many of the water-birds of the country.

An attendant was left in charge of the exhibits during the continuance of the exposition, and at its close the collections were carefully packed and a majority of them forwarded direct to New Orleans, a few being returned to Washington to be remounted, as a part of larger and more complete collections, before shipping to the New Orleans Exposition.

THE EXHIBIT AT CINCINNATI.

The Cincinnati Industrial Exposition is an institution of some years' standing, and receives the cordial support of the most prominent business men of the city. Expositions have been held here with considerable regularity, and a suitable and substantial brick building has been erected by the management. It is located in the heart of the city, and the attendance is usually large. For the season of 1884 the Exposition opened on September 3, closing on the 4th of the following month.

As most of the space was allotted before the bill authorizing Government participation in the Exposition had become a law, a second building, to accommodate the Government exhibits, was found necessary, and the management erected a temporary structure near the main entrance, having dimensions of 50 by 200 feet. This was divided between the several Departments, 3,322 square feet, or nearly one-third of the entire building, being allotted the Smithsonian Institution. This space was situated at one end of the structure, thus admitting of a satisfactory and very pleasing installation.

As soon as the Louisville exhibits were in place, the work of preparing those for Cincinnati was vigorously pushed, and the entire collection, consisting of eighty cases, with a weight of 24,321 pounds, was shipped on August 26, reaching the exposition on September 1. A very large force of men was at once set to work to unpack and install the exhibits, and by the opening of the exposition the arrangement was practically completed.

As at Louisville, the exhibits were largely educational, and included such objects as it was thought would be most appreciated by those who saw them. One of the striking features was an alcove containing a collection illustrative of the social life and industries of the Eskimo and the Indians of the Northwest coast; the dwellings, household utensils, and implements of war, hunting, and fishing, as well as the arts of the two races, being shown in such a manner as to afford accurate means of comparison. A life-size bust, in plaster, of one of the prominent Indian chiefs, and portraits in oil of thirteen others, were also exhibited. Another important feature was a large and valuable collection of minerals yielding gems and ornamental stones. The natural history department contained a small but choice collection of taxi-

dermy, including game and water-birds, sparrows, and a few mammals, while a number of Audubon's colored plates of North American birds were framed and hung upon the walls. Two cases were devoted to a large collection of plaster casts of the more common snakes and turtles of the United States. The methods and apparatus employed in the great ocean fisheries and in fish-culture were graphically represented by means of two extensive series of photographs, the larger series being solar enlargements, having dimensions of 30 by 40 inches. In the fisheries section was also shown a large and valuable collection of plaster casts of the important food-fishes of the country, including both fresh and salt water species. The collection of textile fabrics was very complete, including samples of many American and foreign fabrics, from the cheapest to the most expensive. Two alcoves, which attracted considerable attention, were devoted to photo-lithographs of Japanese pottery, and to a large collection of photographs showing the art and sculpture of the early Saxons.

As at Louisville, the collections were placed in charge of an attendant, who looked after the interests of the Smithsonian during the continuance of the Exposition, and at its close the exhibits were packed, and the bulk of them shipped to New Orleans, to be installed with other exhibits at the Exposition in that city.

NEW ORLEANS EXPOSITION.

It was not definitely known until the passage of the appropriations for the New Orleans Exposition what amount of money would be placed to the credit of the Smithsonian Institution, and it was, therefore, impossible to make any definite and detailed plans in connection with this work; but when the amount so appropriated had been ascertained, the plans were matured, and immediately upon the shipment of the materials to the expositions at Louisville and Cincinnati, attention was turned to the work of collecting, arranging, mounting, and labeling materials for New Orleans.

A force was organized by Professor Goode for this work, of which Mr. R. Edward Earll was the executive officer and Mr. W. V. Cox was the financial agent. The curators of several departments of the Museum were designated by Professor Goode to undertake the preparation of special exhibits for their respective departments, and definite sums of money were placed at their disposal for this work. Such assistants as were needed were furnished to each department for the preparation and mounting of material; and much of the duplicate material under their charge in the Museum was utilized. A number of the curators visited different localities for the purpose of obtaining specimens to complete their series. Much of the material exhibited at Louisville and Cincinnati was forwarded direct to New Orleans immediately upon the close of those expositions, and by the middle of November the shipping of material from Washington was begun, and the en-

tire collection, consisting of seventeen car-loads, was forwarded within a few weeks.

A separate building was provided for the display of Government and State exhibits, this being 885 feet long by 565 feet wide. A strip 185 feet wide, extending entirely across the center of the building, was assigned to the Government Departments, the space on either side being assigned to the several States, the Educational Exhibit, the Woman's Department and the exhibits of the colored people, occupying the galleries of the building. At a meeting of the Government board for the assignment of space to the various Departments, a strip 20 feet wide, extending entirely across the center of the building, was set apart for a main aisle or thoroughfare; the remaining space was distributed among the different Departments, the Smithsonian occupying a position immediately at the left of the main or Prytania street entrance, 82½ feet wide, and extending along the central aisle for a distance of 300 feet, or to a point somewhat beyond the center of the building, and, in addition, the two large offices adjoining the entrance. On December 6, Professor Goode, accompanied by Mr. Earll, left Washington for New Orleans, for the purpose of making preliminary arrangements and supervising the installation of the exhibits, having been preceded by Mr. Henry Horan, with a force of mechanics and trained workmen from the National Museum, consisting of Messrs. Reed, Deery, Kenyon, Neale, and Wallingsford. As soon as the exhibits arrived telegrams were sent to a number of the curators who had prepared the collections for their several departments. These reported in person or by representative to make the necessary installation of their material. Such additional labor as was required was obtained in New Orleans, and the work of installing the exhibits was pushed as rapidly as possible, until everything was finally arranged, after which the curators and mechanics returned to Washington.

The Smithsonian space, covering an area, exclusive of offices, of 24,750 feet, was divided among the different departments as follows:

	Square feet.
Ethnology	1,904
Archæology	406
Textiles	1,624
Naval Architecture	686
Graphic Arts	652
Fisheries and Fish-culture	2,345
Animal Products	2,400
Mammals	1,082
Exhibit of Society of American Taxidermists	595
Birds	540
Reptiles	300
Mollusks	1,328
Minerals	1,290
Lithology and Physical Geology	384
Metallurgy and Economic Geology	2,274
Workshop	500
Aisle space	6,450

Professor Goode remained until after the opening of the Exposition, when pressing duties at Washington required his return. In his absence, Mr. Earll was designated as Deputy Representative, with Mr. M. P. Snell as secretary, and W. H. Abbott, Arthur Brauer, and E. W. Atfield as assistants, these constituting the permanent force during the continuance of the Exposition. Mr. J. Warner Edwards, of Philadelphia, a scientist of wide experience, and a specialist in mineralogy, crystallography, and lithology, who was spending the winter at New Orleans, kindly volunteered his services, which were very gladly accepted. Mr. Edwards remained during the entire period of the exposition, and rendered the most valuable assistance, not only in connection with the departments in which he was especially interested, but in the general work of administration.

THE ETHNOLOGICAL EXHIBIT.

The ethnological exhibit prepared under the direction of Prof. Otis T. Mason, curator of the department of ethnology, consisted of a collection illustrating the social condition of the various tribes of North American Indians and Eskimos. It contained a large series of the costumes, weapons of war and chase, household utensils, tools, and games of the different tribes, with samples of their basketry and decorative work, including painting and carving, with full-sized busts, in plaster, of several of the leading chiefs. This exhibit occupied twenty-seven cases, the educational idea, which was carefully worked out being prominent in its arrangement.

Adjoining this department were six cases set apart for the archæological collections, consisting of stone implements from various localities in North America, arranged and mounted under the direction of Dr. Charles Rau, curator of the department of prehistoric anthropology.

TEXTILE EXHIBIT.

A large and interesting collection of textiles was prepared under the direction of Mr. Romyn Hitchcock, acting curator of the section of textiles. This collection was intended primarily to show the numerous fibers used in the manufacture of textiles, and, as far as practicable, the different stages of preparation and the processes of manufacture, beginning with the raw material and ending with the finished product. It was not limited to American fibers, but included textiles from the Philippine Islands, Japan, China, Siam, Spain, Portugal, England, and other countries. Prominent among the exhibits were esparto grass, agavi fibers, jute, flax, Spanish hemp, ramie, Chinese grass cloth, a large collection of raw cotton and cotton cloths, a collection of silk, including the cocoons and raw silk and the manufactured goods. The collection also contained specimens illustrating the manufacture of hair-cloth and carpets of various kinds. The whole was neatly mounted in standard Museum

trays, each specimen being provided with a printed descriptive label. The collection filled twenty-one standard cases, occupying floor-space of more than 1,600 square feet.

EXHIBIT OF NAVAL ARCHITECTURE.

The preparation of a collection illustrating the development of the vessels of the merchant marine was undertaken by Capt. J. W. Collins, of the U. S. Fish Commission, who visited the different centers of the ship-building industry and obtained builders' models of vessels of different types, the series beginning with the primitive forms, and ending with those of the most modern pattern. Prominent among these were models showing the development of cotton ships. In addition to the above were exhibited several fine models, belonging to the section of naval architecture in the National Museum. These included a full-rigged whaling-ship, a Chinese war-junk, and a three-masted schooner of modern build. Messrs. Higgins & Gifford, a firm engaged extensively in the manufacture of all kinds of sail-boats, row-boats, and yachts, sent an interesting collection showing the different types of boats manufactured by them, including a model of the dory "*Centennial*," the smallest boat that ever crossed the ocean.

THE ART EXHIBIT.

A collection to illustrate the growth of art was prepared by Prof. G. Brown Goode. It consisted of about one hundred and twenty autotypes, representing the most noted pictures of the principal artists of the world arranged chronologically by countries. The collection began with Cimabue, the most noted artist of the thirteenth century, and contained representations of the work of prominent artists from that time to the present.

In addition to the foregoing, the collection contained a very interesting series of autotypes representing noted pieces of sculpture, these being confined chiefly to representations of the works of Greek and Italian sculptors.

Besides the autotypes, there was an exhibit prepared by the Photo-Engraving Company, of New York, to illustrate the process of photo-engraving; another, prepared by H. C. Whitcomb & Co., illustrating the process of stereotyping; and a third, by the same firm, showing the most modern methods of electrotyping.

THE FISHERIES AND FISH-CULTURAL EXHIBITS.

The collection illustrating the fisheries consisted of about one hundred and fifty framed photographs, solar enlargements, and drawings in crayon illustrative of the apparatus and methods employed in the sea and river fisheries of the United States, and, in addition, a very complete collection of models in plaster of the principal food-fishes of North America, including both the marine and fresh-water species. There were also exhibited a series of diagrams prepared by Prof. W. O. At-

water showing the nutritive qualities of the leading food-fishes, and tabulated statements of the nutritive values of fish as compared with other foods. The exhibit also contained a full-sized whale-boat, thoroughly equipped with apparatus for the capture of whales, including not only the old-style hand harpoons and lances, but also the modern swivel-gun and the explosive cartridge used in connection with the same.

The fish-cultural exhibit, prepared under the direction of Col. Marshall McDonald, of the U. S. Fish Commission, consisted of a series of six tables containing hatching apparatus in which the embryos of the whitefish, salmon, and other species were kept during their development, and small aquaria in which the newly hatched fry were exhibited. In addition there were six large aquaria containing a number of different species of fish from the ponds of the U. S. Fish Commission at Washington, including the gold-fish, golden ide, German carp, trout, salmon, and other kinds. There was also a series containing numerous forms of hatching apparatus used at different hatcheries belonging to the U. S. Fish Commission, and models of various kinds of fish-ladders or fish-ways. Arrangements were made with the management of the Exposition for having a supply of water for conducting the hatching operations, and at intervals of two or three weeks quantities of eggs of different species were shipped to New Orleans and placed in the hatching apparatus, where they were allowed to remain until hatched. This exhibit was, perhaps, the most popular in the entire exhibition, and during the time when clear water could be obtained and the young fish were hatching, a majority of the people attending the exposition found their way to the space, some of them lingering for hours.

On February 18, Colonel McDonald arrived with U. S. Fish Commission car No. 3, containing a full equipment of hatching and transporting apparatus. This car was placed on a side track at the Prytania street entrance of the exhibition, adjoining the Smithsonian space, and was open for inspection daily from 8 in the morning until 6 in the evening. In it were shown not only the processes of hatching, but also the methods employed in transferring the fry to waters very remote from the hatchery. After the fish-cultural exhibit had been installed, Colonel McDonald returned to Washington, and J. Frank Ellis was placed in charge of the car, and James Carswell assumed control of the fish-cultural display in the Smithsonian space in the Government building. The car remained until the middle of May, when it was recalled, to be used in the distribution of shad from the Fish Commission stations in Washington and Maryland.

THE FISH COMMISSION STEAMER ALBATROSS.

The steamer *Albatross*, belonging to the U. S. Fish Commission, was engaged during the winter of 1884–'85 in an investigation of the cur-

rents, temperature, and life of the ocean in the vicinity of the West Indies and in portions of the Gulf of Mexico. By permission of the U. S. Commissioner of Fisheries, the vessel made a visit of a few days to New Orleans. On her arrival in that city the exposition management placed a portion of the exposition wharf at her disposal, where the steamer was thrown open for inspection by visitors to the exposition as a part of the exhibit of the U. S. Fish Commission. The apparatus employed in her scientific investigations was arranged on deck; and interesting forms of marine life recently taken in the deep waters of the Gulf of Mexico were removed from the tanks and placed in glass bottles in the steamer's laboratory, where they could be viewed by those who were interested. At the request of Capt. Z. L. Tanner, an efficient corps of officers and scientists remained constantly on duty to inform the visitors of the general character of the work in which the steamer was engaged, and to explain the workings of the apparatus. After a stay of ten days, during which time she was visited by a very large number of people, she left the exposition in order to resume her work which had been temporarily discontinued.

THE ANIMAL PRODUCTS EXHIBIT.

Adjoining the fish-cultural exhibit was a large collection of material showing the products of the animal kingdom, and, as far as practicable, the methods employed in their preparation. In this collection were shown the methods of utilizing the hair, fur, feathers, skin, scales, flesh, bones, horn, teeth, claws, viscera, and excrements of various animals. Portions of this collection were very complete, the exhibit of furs, for example, containing specimens of nearly every fur-bearing animal in the United States. The collection was installed in thirty-five cases, occupying a floor space of 2,400 square feet.

At one end of this collection, and serving as a connecting link between it and the natural history department, were several cases illustrating the methods employed in the capture of animals. In these were shown, either by models or pictures, various forms of traps used in different portions of the country by the Indians and whites in the capture of birds, mammals, and fishes.

MAMMAL EXHIBIT.

As soon as it became evident that the Smithsonian Institution would be required to send material to New Orleans, the subject of getting a large and complete exhibit of the mammals of the country was discussed; but when the definite amount of the appropriation was ascertained it became necessary to materially change the plan, in order to bring the exhibit within its proportional limit as compared with other departments. The exhibit was prepared under the direction of Mr. F. W. True, curator of the department of mammals, and from his

Museum report on the subject the following description has been obtained:

It was intended that the entire existing mammalian fauna of North America from the Isthmus of Panama northward should be exhibited species by species, both by skins or casts and skeletons, and that some of the more important extinct fauna should be restored. This plan necessarily suffered much modification after a short time, when it was found that neither money, time, nor materials sufficient to assemble such a collection before the opening of the exposition, were at command.

With the intention, however, of having every important species represented, the curator visited the establishments of all the principal dealers in natural history material, and the collection of duplicates in the Museum was also drawn upon very largely. It was found that only a very small number of species were anywhere on sale, and that the Museum must rely upon its own resources. This it was able to do to a very considerable extent, although it was found necessary to withdraw some mounted specimens from the regular exhibition series; a proceeding which the curator carried out with great reluctance.

The total number of specimens exhibited was one hundred and sixty, representing one hundred and fifty species and varieties. The series includes all the North American ruminants except the musk-ox; all the important carnivores, both aquatic and terrestrial (especially the fur-bearing family, *Mustelidæ*); all the native beneficial or noxious rodents; representative species of porpoises; the manatees; and the more characteristic monkeys, sloths, bats, and insectivores. In addition, a series intending to represent all the orders of the class mammalia was prepared.

The collection was exhibited in four large cases, except the ruminants, for which a separate large terraced stand was provided. The first case contained the cats, dogs, bears, etc.; the second, the seals and whales; the third, the monkeys, weasels, bats, and insectivores, and the first group of rodents, the endentates and opossums, and the series representing the orders of mammalia. The large terraced stand, as already stated, supported only the ruminants.

It will be observed that this collection, although considerably smaller in point of number of specimens than that exhibited at the Centennial Exposition, still contained representatives of almost the same number of species.

In addition to the specimens already mentioned, another small series was sent to New Orleans, representing the character of work done in connection with the department of osteology. It was at first intended that the different species of animals should be represented by skeletons as well as by mounted skins, but this plan was in the end found impracticable and was finally abandoned.

Mr. William T. Hornaday, chief taxidermist of the National Museum, visited New Orleans for the purpose of unpacking and installing this collection.

THE BIRD EXHIBIT.

Mr. Robert Ridgway, curator of the department of birds, was charged with the collection and preparation of the material for this exhibit. It consisted largely of specimens selected by him from the duplicates of the collections under his charge, these being finely mounted with a view to their display at the exposition. From Mr. Ridgway's report on these collections the following description is obtained:

The department of birds prepared for exhibition at the New Orleans Exposition a collection of North American game birds numbering one hundred and sixty-three finely mounted specimens, and representing nearly all the species. The exhibit was at first intended to be much more comprehensive, the original plan being to exhibit

all the known species of North American birds, so far as could be secured, together with typical groups to illustrate the avian faunæ of the several zoogeographical divisions of the earth's surface. The collection had been nearly completed on the original plan when it became necessary, on account of the limited space available at New Orleans, to greatly reduce the exhibit, and to limit it to the game birds above mentioned. This collection was installed by Dr. Leonhard Stejneger, assistant curator, who left Washington January 3, and returned on the 16th of the month. The collection filled two double museum cases, fitted with rows of terraced shelves. Each specimen was mounted on a stand of polished black walnut, and provided with a printed label, on which were given, in large, clear type, both the scientific and popular names.

THE REPTILE EXHIBIT.

This exhibit included a large and exhaustive series of life size models in plaster of the turtles and snakes of North America, each having been carefully colored by Mr. Schindler from living specimens or from colored sketches.

THE MOLLUSK EXHIBIT.

The exhibit in this department was prepared under the direction of Dr. William H. Dall, curator of the department of mollusks in the National Museum, and Dr. R. E. C. Stearns, assistant curator. Dr. Dall, in his report for 1885, described it as follows:

The exhibit in this department of natural history probably surpassed in extent and general excellence any previously made at the great expositions. It was arranged in twenty-one flat table cases, the specimens being placed in trays inside of the cases, and each of the trays fully labeled.

The general system followed was a geographical one, and presented a characteristic representation of the more conspicuous and interesting forms of the various zoogeographical provinces.

The exhibit included several cases of the fresh-water mussels (*Unionidæ*) of the Mississippi drainage area, remarkable for the great number and beauty of the shells, also the rare and peculiar forms belonging to this group from other parts of the world. The land and pond snails of the Mississippi basin were each represented by a single case.

The marine shells of the Atlantic coast of America from the Arctic Sea to the Caribbean, and the sea shells of the Pacific coast from Bering Sea to Panama, including the principal species inhabiting the tidal areas of Puget Sound, to the north, and the Gulf of California, to the south, were similarly displayed.

Other cases contained selected specimens from the Indo-Pacific region, such as live in the great coral areas of the warm seas between western America and eastern Asia.

Four cases were devoted to the edible mollusca of the United States. Two of these contained the clams, cockles, etc., of the Atlantic sea-board, and in the other two were exhibited those of the shores of western America, from Alaska to San Diego.

The preparation of the material was completed under the supervision of Dr. Stearns, who visited New Orleans and gave his attention to the proper installation and labeling of the exhibit.

EXHIBIT OF THE SOCIETY OF AMERICAN TAXIDERMISTS.

At the invitation of the Smithsonian Institution the Society of American Taxidermists prepared for exhibition at New Orleans a series of specimens illustrative of the work of members of that society. Mr.

William T. Hornaday, president, and Mr. F. A. Lucas, secretary, gave their personal attention to obtaining and arranging the material. The exhibit was large and instructive, occupying a floor space of nearly 600 quare feet. It contained specimens of the best work of the leading members of the society, including Messrs. Hornaday, Lucas, Fraine, Webster, William Palmer, Joseph Palmer, Hedley, Forney, Bailly, Wallace, Jeremiah, and Richardson.

THE MINERAL EXHIBIT.

The exhibit of minerals was collected and arranged under the direction of Prof. F. W. Clarke, curator of the department of minerals, and Mr. W. S. Yeates, assistant curator. From the annual report of the curator the following account of the exhibit is taken:

The department of minerals was represented at the New Orleans Exposition by a collection of the minerals which afford gems and ornamental stones, and by a collection of cut and polished stones. The minerals were classified after Dana's system, and were displayed in seven flat-top table cases. The gems were more difficult to classify, it not being possible to arrange them with advantage, according to their chemical constitution. The best arrangement seemed to be one which would have reference to their intrinsic value; but it was found more convenient to allow the more uncommon stones a place near the lower end of the case in which the gems were exhibited. The second and last cases began with quartzes, and was followed by the feldspars and other ornamental stones. The specimens in these two cases were mounted on white and black velvet pads, which displayed them to great advantage.

The exhibit was arranged by Mr. Yeates, who visited New Orleans for that purpose.

THE LITHOLOGICAL EXHIBIT.

Under the direction of Mr. George P. Merrill, acting curator of the department of lithology and physical geology in the National Museum, a large collection of materials was prepared for New Orleans. Many of the specimens in this exhibit were taken from the duplicates belonging to the National Museum, but in order to complete the series Mr. Merrill visited numerous quarries and obtained suitable specimens, many of them being cut and polished before shipping. Mr. Merrill has given the following account of the exhibit prepared by him:

This exhibit consisted of (1) a collection of three hundred and fifty-eight specimens of building and ornamental stones in the form of 4-inch cubes; (2) a collection of some twelve specimens of foreign and native marbles in the form of polished slabs; (3) a collection of one hundred and fifty specimens of rock-forming minerals; (4) a collection called a "structural series," intended to represent all the more common forms of rock structure and texture; (5) a collection of one hundred and ninety-eight specimens of rock illustrating the geology and lithology of the Comstock Lode and Washoe district, Nevada; and (6) a lithological collection comprising five hundred specimens of rock of various kinds and from many sources, both native and foreign, this last, together with collections number three and four, forming a part of the regular educational series of the Museum.

Mr. Merrill went to New Orleans and arranged his exhibit, which was neatly installed, the collection occupying a floor space of nearly 400 square feet.

THE METALLURGICAL EXHIBIT.

One of the largest exhibits in the Smithsonian collection at the exposition was that prepared under the direction of Mr. Fred P. Dewey, curator of metallurgy and economic geology, who, with several assistants, devoted his entire time, for several months prior to the exposition, to the collection and arrangement of materials, James Temple Brown being detailed to make a special collection of coals and articles illustrating the processes of coal mining. From Mr. Dewey's report the following account of the exhibit is taken:

In the first division of this collection—that of economic geology—it was designed to exhibit collections illustrating the different kinds and grades of the ores of each metal, and also a few collections of non-metallic minerals of economic importance.

In the second division—that of metallurgy—it was designed to exhibit collections representing the processes for the extraction of the metals from their ores by specimens, where practicable, filling the gaps by means of illustrations and descriptions, and accompanying them by general illustrations and descriptions, so as to fully explain these processes.

The ore collection was made up with a view to represent all the different varieties of each ore and many of the most prominent mining regions.

The Lake Superior copper region was very thoroughly represented, both on account of the value of the mines, and as representing the kind of collections it is desirable for the Museum to possess to illustrate a region or mine. The region was represented by three prominent mines, showing three different and characteristic occurrences of the ore. In the first place, the so-called mass mines, which are characterized by the occurrence of large masses of free copper, amounting in some cases to many tons of metal in a single mass, were represented by the Central Mine. Mines of this kind also carry considerable quantities of disseminated free copper. In the second place, the amygdaloid mines, which are distinguished by the occurrence of free copper in amygdules, bunches, strings, and sheets, from the size of a pin-point up to a few hundred pounds in weight, disseminated in a soft amygdaloid trap-rock, were represented by the Osceola Mine. In the next place, the conglomerate mines, which are characterized by the presence of free copper mostly in the form of strings in a hard conglomerate of ferruginous quartz pebbles, were typified by the Conglomerate Mine.

Taking the Conglomerate Mine as an example, the collection showed, first, the general character of the ore and the inclosing wall rocks; secondly, the occurrence of the ore at various prominent points in the mine, which were accurately located; and, thirdly, a section of the rocks over a distance of 631 feet, by specimens taken at suitable distances to illustrate the different characters and changes of the material.

The collection in economic geology included placer gold, gold quartz, auriferous gravel, auriferous pyrite, tellutide ores, iridium (iridosmine), native silver, wire silver, horn silver, ruby silver, base ores carrying silver, argentiferous lead ores, tin ores, sulphide ores of antimony, cinnabar, sulphide ores of lead; native copper, including water-worn specimens; mass copper, chips, amygdaloid and conglomerate disseminated free metal, sulphides of iron and copper, oxides, oxidized ores of bismuth, sulphide ores of nickel and cobalt, five hundred specimens of iron ores showing all the different kinds of iron ore found in the country, manganese ore, ores of zinc; anthracite, semi-bituminous, bituminous, splint, and cannel coal, and a large collection illustrating the methods of coal mining, including large photographs (taken by electric light) of the interior of a coal mine, the first views of the kind ever produced; native sulphur, and iron pyrites.

In making up the metallurgical collection it was not possible to exhibit the production of each metal exhaustively, owing to the small amount of suitable material previously in the department and the short space of time available for making new

collections. A few systematic illustrations of metallurgical operations were shown. It was thought best to treat a few subjects thoroughly rather than a large number superficially. After suitable consideration, a few representative works were selected for illustration, and were worked up as completely as possible.

Beginning with the ore as mined, each step in its preparation for smelting was shown, together with the by or waste products of such treatment. To illustrate the smelting operation, the ores, the fuels, the fluxes, and every other material entering the process, each product of each operation up to the final product of the works was shown. To these were added, where practicable, illustrations of materials of construction, such as fire-clays, sands, etc. The furnaces and tools were shown by specimens, views, and descriptions. The interest and value of these collections did not lay so much in the specimens themselves as in their being thoroughly connected, and in the kind and amount of information that was given in regard to them.

The collections in metallurgy comprised collections illustrating the extraction of gold and silver; the manufacture of lead, steel, coke, sulphuric acid, and alloys; the smelting and refining of copper, iron, and zinc. There was also illustrated the practical application of the non-metallic ores by specimens showing the manufacture of sand-paper, asbestus and its uses, abrading and polishing materials, and the utilization of barytes.

This collection, filling nineteen cases, occupied a floor space of nearly 2,300 square feet. Mr. Dewey visited the exposition and remained until all of the collections in his department had been installed.

The Smithsonian exhibit occupied more than a quarter of the entire space assigned to the Government for exhibition purposes, and the attention which the collection received from visitors to the exhibition and from the press was very gratifying, the space being the center of attraction for scientists from various parts of the country and for students from different Southern colleges.

At the close of the exposition several of the curators returned to New Orleans to look after the exhibits belonging to their departments, and a number of professional packers, under the direction of Mr. H. Horan, were sent from Washington to assist in the packing and returning of materials, many of the exhibits from their nature being very fragile and requiring skillful handling. An additional force of laborers was employed, and the work was pushed with all possible speed, so that by the 10th of July the work of packing had been completed and the exhibits were on their way to Washington, Mr. Earll and party leaving on the 14th. By the end of the month the last car-load of materials had reached Washington. Very little loss was sustained from breakage, the exhibits upon arrival being, as a rule, in excellent condition.

PART II.

REPORTS OF THE CURATORS OF THE U. S. NATIONAL MUSEUM UPON THE PROGRESS OF WORK DURING THE FISCAL YEAR ENDING JUNE 30, 1886.

REPORT UPON THE WORK IN THE DEPARTMENT OF ETHNOLOGY IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By OTIS T. MASON, *Curator.*

The work of this department during the year has been for the most part tentative and preparatory in two directions, receiving and caring for new material so as to render it most available and valuable, and preparing series of objects for exhibition, study, and exchange.

In order to give greater efficiency to the former method of cataloguing accessions, the following plan has been adopted. Desultory material is entered as formerly in the standard catalogue; after that a system of card cataloguing of an encyclopædic character enables the curator to gather from many sources all that is valuable about the object in hand.

Whenever a collection of special importance is received from the same locality, the objects are first carefully classified, so as to bring all things together that are alike or that have the same use. These are then entered, as formerly, a separate number being given to each piece that is sufficiently distinct to receive it, but those that are alike or that form a set receive the same number. The card catalogue is also used with this material for the purpose of gathering information. In the register things go by number; in the card catalogue they are arranged by topics and classes of things, so that all information upon each subject will be found together, as in an encyclopædia.

This encyclopædic method has proved of incalculable value in the correspondence of the Museum when difficult questions are proposed for immediate reply.

As soon as this classified entry is made the material is sent to the poisoning department, where it is subjected to a close scrutiny. The curator has devoted much time to this subject, for it is encumbered with many difficulties, each kind of material demanding a different treatment. It is safe to suppose that every destructible specimen which comes into a museum is infested with the eggs or larvæ of moth, dermestes, or other museum pests. The problems to solve at the outset are these:

(1) To destroy the eggs and larvæ.

(2) To preserve in so doing the color and softness of the texture of fabrics, skins, and furs.

(3) To prevent attacks of insect enemies in the future.

(4) To reduce the danger to the curator and others to the lowest amount.

In this department the curator has been greatly aided by the studies of Mr. Walter Hough, who has discovered the following insects at active work destroying museum material: Four species of *Tinea*, the carpet, fur, cloth, and grain moths; *Anthrenus varius* and *A. lepidus*, the all-devouring "Buffalo bug;" *Anobium paniceum*, which destroys wood and basketry; and *Lepisma domestica*, which destroys gummed labels. The work of research in this direction is not quite finished, but the following conclusions have been practically reached:

(1) It is not safe to trust to camphor, pepper, turpentine, etc., in the case of valuable material.

(2) Insect powder soils ermine and other delicate furs and fabrics, and can be used only in certain cases.

(3) Objects soaked in benzine and other light coal-oil products have the larvæ and eggs destroyed, but they are liable to future attacks.

(4) Naphthaline proves efficacious so far in preventing the ravages of insects, but complaints are made of its deleterious effects on the health of laborators.

(5) Insects and larvæ of all kinds are destroyed in furs and fabrics when they are hung in a tight closet exposed to the evaporation of bisulphide of carbon. But this effect is only temporary.

(6) Corrosive sublimate or arsenious acid dissolved in alcohol or water in proportion not exceeding 3 per cent. of the poison, may be applied to furs by spraying, provided the skin is constantly worked while drying. This should be done in open air and with caution. Deer hair is very easily rotted, and should be cautiously treated on the leather side chiefly.

The specimens are then stored in the grand series chiefly by form and use; that is, clothing, tools, household articles, weapons, and examples of higher intellectual activities are grouped together.

Whenever occasion demands, the specimens of a particular tribe, nation, or class of people are stored apart. The effort is thus made to give to each object all the scientific value which it possesses from the very start, and to render it accessible at once for the exhibition, the study or type, and the exchange series.

Convinced that a great national collection should not be forcibly strained into subjection to any one scheme, the exhibition series, so far as they are completed, have been selected to illustrate all the lines of study pursued by anthropologists upon human activities so far as they can be set forth by things, pictures, or graphic tables.

The dominant ideas according to which anthropologists in various parts of the world arrange their specimens may be called the concepts of classification. These concepts are race or tribe, material, structure, and function, progress of invention, and geographical distribution. No *perfect* scheme can omit any one of these concepts. Methods can differ

only in the order in which they are considered and the prominence given to each.

It will be readily understood that the order in which these concepts are taken decides the appearance of a museum. Each one of the first three—race, material, structure and function—may be and in fact is the ruling concept in some museums. To illustrate the methods pursued in these various institutions, and the lessons which they teach, several series are now being arranged, and will be on exhibition as below described. Indeed, some of them are now exposed to the public, but not completely installed or labeled.

As an example of what may be done on the ethnical basis, all of the objects belonging to Eskimo art have been gathered in the East Hall and laid out according to the following concepts in the order named: function or use, location, evolution and varieties. Fourteen quite well-marked, areas have been noted among the Eskimo: Greenland, Labrador and Ungava, Baffin Land, Northern Canada, Northern Alaska, Kotzebue Sound, Bering Strait, St. Lawrence Island and the main-land on either side; Cape Nome, Norton Sound and Yukon Delta (a mixed area); Nunivak and the contiguous main-land, Kuskokvim delta, Bristol Bay, Kadiak and vicinity; and for the Aleuts, the Aleutian chain.

It must be distinctly understood that these areas are wholly secondary to types and material.

In order to ascertain the deficiencies as well as the riches of the Museum, each implement, ornament, etc., is traced through the fifteen areas by means of a set of boxes, one for each area. All the objects in the Eskimo collection being placed in their appropriate boxes, the vacancies will be at once apparent, and proclaim either that the people of that area do not use this device or that the National Museum has not the good fortune to possess an example. In this work the curator has been greatly aided by Lieut. T. Dix Bolles, U. S. Navy, and Mr. E. B. Webster, paymaster, U. S. Navy.

The curator will in the future be able to follow a similar scheme for several other peoples, but thinks that when the material in hand does not fairly picture the total life history of a tribe or race, the best administration to make of the material is to show the elaboration of the various human arts, with a view ultimately to exhibit the progress in culture of the whole race. In this line he has commenced to prepare the following series:

(1) Sets of arrow-makers' tools from all available sources.

(2) The shops, implements, and productions of the potter, with models and pictures of his furnace, processes, etc.

(3) The sets of apparatus used by North American tribes for gambling, arranged typically and ethnically.

(4) Outfits of narcotic indulgence, such as smoking opium and tobacco, betel chewing, etc.

(5) The apparatus of the primitive weaver, mat-maker, basket-maker, etc., in order to understand the origin of the textile art.

Too much emphasis can not be laid upon collecting objects in sets, outfits, suits, contents, packs, apparatus, panoplies, accoutrements. The elaboration of many useful and artistic forms has taken place in an adaptive fashion, as being part of a lot or set like the mutual change of form of insect and flower through the process of fertilization.

When a single object, as a hammer, adze, wedge, hoe, spade, rake, plough, snow-shoe, etc., stands alone as an implement or a product, specimens thereof may be exhibited in series to illustrate the possible lines of inventive progress, care being taken always to note localities and the evidences of historical connection.

In carrying out the scheme of which the Catlin and the Stanley galleries were the commencement, the curator has commenced to collect the actual color of all delegations visiting Washington and to gather a series of painted photographs as the foundation of an aboriginal album of our continent. In this matter great aid has been rendered by the Bureau of Ethnology.

One of the greatest difficulties which a curator has to encounter is that which arises from false location and insufficient data. In the National Museum, as well as in every other collection, are many precious objects gathered long ago, when it was considered sufficient to know that a specimen came from America, Africa, or Polynesia. This is one of the chief hindrances to a purely ethnological scheme, since it is often begging the whole question to assign a specimen to a certain tribe. On the other hand, no harm can possibly come from putting things that are alike in the same case or receptacle.

In order to ennoble this old and imperfectly described material the curator is collecting from absolutely reliable sources single objects and complete outfits of various kinds to act as guides. It has many times happened that one such specimen has really put him in the possession of several, with this added, that the older objects are more absolutely free from the contamination of Aryan influences. For instance, all of Captain Wilkes's American material is labeled northwest coast of America, which means anywhere from the Straits of Fuca to the Bay of San Francisco—a region occupied by many stocks of aborigines. The subsequent collections of Gibbs, Swan, Powers, Green, Ray, the officers of the Army, and the Bureau of Ethnology now enable the curator to definitely locate all of Wilkes's specimens.

The acquisitions of this department are indicated below, arranged geographically and topically. The States of the Union are arranged alphabetically and specimens from each are given separately with a view to stimulating in each an interest in our great national collection. A large number of the specimens accredited to the States were received at the New Orleans Exposition. Especial mention should also be made of the collections of the Bureau of Ethnology, Lieut. P. H. Ray, U. S. *Army,* and Dr. D. Bethune McCartee.

ESKIMO AREAS.

Greenland.—Mesh-sticks for netting (7), Capt. J. W. Collins.

Baffin Land.—Steatite lamp and companion pot, Dr. E. Bessels (7393).

Fort Chimo.—Throwing-stick and case of one hundred and fifty Eskimo dominoes (15388), in three sets.

Kotzebue Sound.—Three labrets and mask of wood, carving in bone, spoon made from sheep's skull; knife, blade, and core of jadeite; harpoon point, five fish-hooks (16827), Woolfe.

Norton Sound Region.—Wisps of sea grass for whipping the body in the bath, parka, housewife, haversack of fish skin, needles, and fish-skin boots, collections of E. W. Nelson.

Nunivak Island Region.—Grease dish, Dall (16230).

Kuskokvim Delta.—Wallet of twined basketry.

Bristol Bay.—Stone ax, hats, women's coats, women's boots, head-dress, ear-pockets, knives, belt of reindeer teeth (16879), ivory carving containing figures representing an Eskimo dance and game of strength (16902), J. W. Johnson.

Aleutian Islands.—Wallets of twined basketry (16754, 16293), Dall and Bean; Bidarka model for three rowers (16914), Department of State, New Orleans Exhibit.

INDIAN TRIBES OF ALASKA AND CANADA.

Klinkit of Alaska.- -War knife, carved wooden pipes, hair, and masks (16771, 17057), from Shaman's graves, Lieut. T. Dix Bolles, U. S. Navy; one hundred and thirty photographs (16912), twined cylindrical baskets.

Haida of Queen Charlotte Island.—Shaman's robe, Haliotis shell ornaments.

Bella Bella of British Columbia.—Cedar bark basketry, Swan.

Aht, Varcouver Island.—Dentalium, fish-hook of pearl shell (17655).

Makah of Cape Flattery and Vancouver Island.—Cedar-bark wallets, kelp for holding food, whale harpoon lines.

Ottawa.—Doll, illustrating half-breed costume.

Iroquois.—Bark canoe, and painting on glass of man and woman in costume.

CONTRIBUTIONS FROM THE STATES.

Alabama.—Choctaw basketry, seed dice, pump-drill still used by negro blacksmiths* (16955).

Arizona and New Mexico.—Twelve photographs Apache (17395), three Navajo prairie-dog arrows (17239), bow, arrow, and quiver of the Navajos (16871), large and beautiful woolen Navajo carpet (16928), Moki coiled basket trays, wicker coiled basket trays, woven dance-belts, painted aprons worn in snake dance.

From J. W. Powell, Director Bureau of Ethnology. (Acc. 16870.) A collection of models exhibited by that Bureau at New Orleans, as follows: (76690) Pueblo of Oraibe, Moki, Ariz.; (76691) pueblo of Mashonginavi, Moki; (76692) pueblo of Schomovi, Moki; (76693) pueblo of Wolpi, Moki; (76694) pueblo of Shipanoluvi, Moki; (76695) pueblo of Shemopavi, Moki; (76696) pueblo of Tewa, Moki; (76697) relief map of ancient province of Tusayan, Moki; (76990) Casa Blanca cliff-ruin, Cañon de Chelly, Arizona; (76993) small cliff-ruin in Cañon de Chelly; (76999) mummy cave cliff-ruin, Cañon de la Muerte, Arizona; (76995) cliff-ruin in Mancos Cañon, Colorado; (76996) restoration, cave town on Rio de Chelly, Arizona; (76992) ruined pueblo of Wejegi, Chaco Cañon, New Mexico.

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*See page 90, bottom.

Arizona and New Mexico—Continued.

Zuñi specimens from the Bureau of Ethnology, collected by Col. J. Stevenson: (15874) pump-drills, darts and targets for children's play, stone hammers of various patterns, tanned deer skin, pottery-making stools (starting stone, gourd scraper, rubbing or polishing stones), Cohonino tanned deer skin, bangs for the hair, breech-clouts, armlets, sashes, garters, rattles of gourd and tortoise shell, painted images of wood, seed-baskets, mortars and pestles, flaking hammers, paint and paint mortars, strainer (16392), and from Laguna corn bread and flour. From the modeling department of the Bureau of Ethnology the following models have been received:* (16970) Zuñi, Wejegi, Taos, Tacoma, cliff ruins, small pueblo, Tegua, mummy cave, cliff fortress, seven models of pueblos, map in relief of Tusayan, two cave towns, Casa Blanca, ancient tower.

California.—From Indians of Hupa Reservation, collected by Lieut. P. H. Ray, U. S. Army:* (172391) Head ornaments, hair-brush of vegetable fiber, necklaces of pine seed, dance dresses of buckskin adorned with grass embroidery, mats of twined basketry, stones for boiling mush, paint mortars, pestles and mortars; spoons of horn, stone, and wood; mush-paddles, straight smoking-pipes of wood and stone, dance rattle of deer's trotters, basketry hats, ornamental baskets, grass and fiber for basketry, dip-net and seine twine and needles, salmon spear heads and harpoons; Indian money of dentalium shell wound with fish skin, secured in cash boxes of elkhorn; chisels and wedges of elk horn, girdle of woven basketry and buckskin, dance hats of great value, pillows and stools of wood resembling those of New Guinea, head scratchers, hammers and adzes of stone, fire-drills, stone frying and baking pans, obsidian and jasper knives of great beauty, bows and arrows of great beauty, harpoons, men's clothing; dance aprons and cinctures of seeds, ornamented with straw work; dance wand of basketry, tobacco baskets, panniers, and cradles of basketry. From McLeod River Indians, from the collections of L. W. Green: (17414) Complete outfit of the bowyer and fletcher, shafts, resin, feathers, obsidian and jasper, pitching stone, chipper, sandstone, polisher, straightener, sinew, sinew-scraper, fish-skin padding, paint and brushes, saw, together with a beautiful outfit of bow, arrows, and quiver. From Mr. P. Crowley, of San Francisco: Complete outfit of opium-smoking, consisting of opium, pipes, match-boxes, brushes, trays, scissors, pipe-cleaners, roasting needles, stand, lamps, Chinese cups, and laundry stamps (17215.)

Dakota and Indian Territory.—Collection of Governor Furnas, of Nebraska, among Sioux Indians: (17069) Pemmican maul, pipes, buffalo lance, clarionet, war clubs, quiver and arrows, rattle, carved spoon, head-dress, lariats, tomahawk pipe, photographs of Sioux; models of Sioux chiefs, life size, in plaster, by M. Collin; photographs of Winnebagos, model in plaster of Pawnee scout, model of Arrapaho Chief, Red River car and harness, head-dress of war chief and parflesh case, bows and arrows of Crow Indians, photographs of Osages.

District of Columbia.—Game of shuttlecock.

Georgia.—Baskets from New Orleans Exposition (16188).

*Indiana.**—Models of Studebaker's wagons and carts.

Kentucky.—Pictures illustrating industrial life in that State.

Louisiana.—Specimens from the Choctaw and Shetimasha Indians. Baskets of cane, calico dresses, blow-guns and darts, bows and arrows, raquets for foot game, beaded moccasins, belts, and caps (16953.)

*Maine.**—Passamaquoddy Indians, baskets (17658).

*Maryland.**—Rude pipes (17364.)

Mississippi.—Home-made basketry, palmetto and shuck hats, horse collars, wooden trays and dishes (16961).

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* See page 90, bottom.

New York.—From General Porter, complete opium-smokers' outfit (17198); from Peck & Snyder, series of modern games, dumb-bells, gymnastic apparatus, croquet, boxing-gloves, archery, cock fighting, and theatrical outfits, Indian clubs, skates, lawn tennis, lacrosse, base-ball, foot-ball, foils and masks (11487).

From the Co-operative Dress Association (12096), æsthetic dress of 1882, modern adaption of ancient Grecian dress.

From Capt. Charles Bendire, snow-shoes from the Adirondacks (17472).

New Hampshire.—Paper-hangings of last century.

South Carolina.—Frontier conveniences and clothing.

Texas.—Old gun-flints.

Virginia.—Dental snuff and plantation specimens.

Nevada.—From the Ute Indians, basket-hats, basket harvesting-wands, wicker cradles, fanning and roasting trays, water-tight archer bottles, carrying-baskets (16956).

Utah.—Quiver, bow, and arrows, rabbit-skin robes, photographs of headmen (13581) from Bureau of Ethnology.

Wisconsin.—Wooden shoes worn by Swede and Norwegian settlers (16726).

Wyoming.—Saddle of Indians (17121).

MEXICO.

The objects from this locality are principally from the collections of Dr. Edward Palmer in Sonora and Chihuahua, and from the Mexican Government at the New Orleans Exposition. The donations include the following examples: (17111, 17070, 16860,) Skull of Tarahumara Indian, thirty-nine casts of Mexican antiquities made by Eufemio Abadiano, illustrated atlas of Mexican social life and natural history, atlas of primitive husbandry, such as planting board, cactus fruit picker or tongs, primitive spade; weapons, including sling, bow, arrows, and wrist-guard of Tarahumaras; horse-trappings, bridles, saddles, blankets, stirrups, tether ropes, cinctures; mealing tools, mortars and pestles, metates and mullers or brazos; textile products, many wicker baskets, wallets, bark cloth, sacks of pita and other native fiber, water filters, jars, water skins.

Complete outfit of Guadalajara potter, consisting of clay in various stages of preparation, molds for modeling parts, molding tools of rosewood, paint and brushes, casts and vessels in different stages of completion, model of pottery, and drawing of shop.

Household apparatus and utensils: Dippers of gourd, ladles, spoons of wood, mush sticks, chocolate-cups, stirrers, pulque-sieves; trough for washing.

Articles of costume: Straw and palm hats, rain-coats, serapes, belts, sandals, specimens of coarse cloth, money-bag, wash-rags of pita fiber, hair-brushes of vegetable fiber.

Furniture: Beds of cocoa and pita fiber, mattresses, pillows, floor mats, chairs, floor brushes, wooden trays, brooms, scrubbing brushes, chairs, shingle-pins, fire-fans, torches, pot-carriers, head-bands, model of pulque gatherer, gathering nuts, water-carriers' yoke.

Ceremonial objects: Masks, dance-rattles, incensaños, uniforms of police and soldiers of different Mexican corps, fire-mattress, horse equip-

equipments and trappings, in all seventeen suits; quoits, stones for hop-scotch, foot-ball, fiddle and bow.

Works of art: Engraved and painted gourds, many specimens and patterns, lacquer plates, waiters and trays, straw placques, photographs.

MIDDLE AND SOUTH AMERICA.

Central America.—Carved jicara shells and gourd, packing baskets, planks hewed out with stone implements, a whole tree being wasted for each plank.

Cuba.—Series of photographs of people and scenery.

Jamaica.—Hats, basketry, brooms, brushes.

Hayti.—Hammocks, canes, clay pipes, bastinado, mortar and pestle, vessels of turned wood, rope of pita fiber, lace wood whips, horse trappings, pack saddles, saddle hampers, photos, photographs of Presidents, seventeen oil portraits of Presidents, (17026) powder-boxes.

Antilles.—Water-vessels and basketry, specimens of agave fiber, boxes of lignum-vitæ.

British Guiana.—(16660) Native brushes of vegetable fiber, ornaments of seed-work.

Venezuela.—Bead-belts.

Argentine Republic.—Hair mats.

Peru.—Spindles.

EUROPE.

England.—Exchequer tally-stick (16214), shawls, hats, and cutlery from New Orleans Exposition (16690).

Norway.—Tschukchi cross-bow, piggin, chopping-board, shoes.

Belgium and Holland.—Wooden shoes, rope, clay pipes, horse-wrappings, album of costumes (16642), fishing-nets, and twine.

France.—Fibers, charts, five models of ethnic types, life size; ancient loom weights.

Italy.—Hats, photographs of social life and costume, wine-flasks, Sicilian plow and yoke (16574).

Germany.—Scythes, baskets, agricultural implements, and mechanical tools, canes, dolls, and toys, clothing, vases (16573, 16645).

Russia.—Harness and yokes, boots and shoes, clothing (16525, 16617).

Turkey.—Charms, clothing.

Scotland.—Shepherd check shawl (16646).

ASIA.

Asia Minor.—Grecian bowl (16332).

Syria and Arabia.—Writing apparatus, modern Syrian clothing, carvings in olive wood, stone and shell, turbans, shoes, veils, incense, inscriptions, hubble-bubble pipes, newspaper, pens (* 16413, * 16637, * 16995).

Persia.—Photographs of New Orleans Exhibit, shawl, sandals, lacquer-box, and book-cover, clothing.

India.—Model of catamaran, casts of Hindoo faces, string of beads, sandals, torches, embroidery, entire outfit of betel chewer, image of the sun god, lac tray, shanka shells, kookrie or set of knives, fork and chop-sticks, clothing (16635, 17430, * 17306, * 17458, 17243, 17491, 16694, 16555, 16640).

China.—Official hat-box, jade inkstand-holder, rattan dipper, student's book-case, clothing, historical illustrations, copies of Pekin Gazette, fans, screens, pictures on glass, rush table, bamboo shoe, writing materials, idols, quiver and arrows, inlaid plaque from Loochoo, bow and arrows from Formosa. A large number of these gifts were from Dr. D. B. McCartee.

* See page 90.

Japan.—Magic mirror, books, maps, photographs, clothing, model of house, weapons, idols, illustrations of natural productions, screens, painting on silk, social objects, writing material, illustrated cyclopædia.

Corea.—Inlaid metal work, printing block of wood, books, illustrated works, sketches of Corean social life and natural history, screens and blinds, cabinets, stove, embroidered badges, pillow ends, clothing, hats in great variety, oil paper coats and hats, mourning costume, matting, fans, shoes, rice bowl, and other food implements, feather ornament, varieties of paper, sadiron, mirror, stone ornament, money-bag, games of chance, washing sticks, soldiers' dress, tweezers, pipes, hampers, knife, comb, full male, female, and child's costume, mourner's dress, map of Seoul, old screen in eight parts, lac canister and box, straw image.

AFRICA.

Madeira.—Photographs of costumes.

Barbary States.—Grass fabric, embroidered and embossed leather, specimens of native cotton fabric, velvet embroidery, weapons in embossed leather scabbard, basketry, shoes, turbans, lamps, blankets, suit of clothing, threshing sledge, brass trays, water bottles.

Egypt.—Pipes, shoes, lantern, scarabaei, and mummy.

Madagascar.—Hammer, tent, map, bread, palm fiber.

POLYNESIA.

*Samoa.**—Whip of cocoa fiber, complete apparatus for kava drinking, cinctures, rugs.

Sandwich Islands.—Photographs of natives, basketry, tapa cloth, straw hats.

New Zealand.—Maori seed wallet, spear head, fig leaf, "shell," model of outrigger.

Australia.—Photographs of aborigines, views in Victoria.

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* See page 90.

CHART OF THE ESKIMO COLLECTIONS IN THE U. S. NATIONAL MUSEUM.

This chart is designed to show the locations in which each species of Eskimo apparatus is represented by specimens in the U. S. National Museum. The crosses stand for one or more specimens, and the vacant places merely exhibit the deficiencies of the national collections. The objects may be in use in such places, and doubtless in many cases are, but the fact can not be proved by this series.

	Greenland.	Labrador.	Insular Canada.	MacKenzie District.	North Coast, Alaska.	Kotzebue Sound	Bering Straits, Asiatic.	Sledge Island, Cape Nome.	St. Lawrence Island and Plover Bay.	Norton Sound.	Yukon River.	Nunivak Island.	Kuskokvim.	Bristol Bay.	Aleutian Peninsula.	Aleutian Islands.
Needle cases		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Needles					+			+		+	+					
Needle-board										+	+					
Thimbles		+	+		+	+	+				+		+	+		
Thimble-holders					+	+	+	+	+	+	+	+				
Thimble-guards			+	+		+	+	+		+						
Work-bag fastener										+	+	+	+			
Awl or bodkin	+	+	+			+	+	+	+	+	+	+	+	+		+
Seine-needle		+			+	+	+	+	+	+	+	+	+	+		+
Seine-spacer						+	+	+	+	+	+	+	+	+		
Seine-sinkers					+	+	+	+								
Bobbins							+	+			+					
Knot-pickers											+		+	+		+
Necklaces			+	+										+		
Bracelets			+	+	+			+						+	+	
Ear-rings				+		+	+	+	+	+	+	+	+	+		+
Labrets				+	+	+	+	+	+	+	+	+	+	+	+	+
Grass combs					+	+	+	+	+	+	+		+			
Hair-combs	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
Snuff-tubes								+		+	+	+	+			
Cap boxes								+		+			+			
Powder-chargers		+			+			+		+	+	+	+	+		
Bullet mold													+			
Pipe bowl molds										+						
Fungus, snuff and Tobacco-boxes					+	+	+	+		+	+	+	+	+		
Trinket boxes						+		+		+	+	+	+	+		
Canoe-models		+							+	+		+		+	+	+
Canoe-attachments, spear-rests			+			+	+	+		+	+	+	+		+	
Canoe attachments, cord fasteners, and sail blocks	+						+	+		+	+					
Hooks and cleats								+		+	+	+	+		+	
Cord fasteners			+	+	+	+	+	+		+	+	+	+		+	
Sledge-attachments, bells, swivels, and whip-handles			+		+	+	+	+	+	+	+	+		+		
Spear-attachments, guards, and detachers			+	+	+	+	+	+	+	+	+	+	+	+		
Float attachments, handles, nozzles, rattles, plugs			+	+		+	+	+	+	+	+	+	+	+	+	
Buttons and toggles			+	+	+	+	+	+		+	+	+	+	+	+	+
Pendants		+	+	+		+	+	+	+	+	+	+	+	+		+
Drill-bows			+	+		+	+	+		+		+				
Carved images, ivory, stone, wood		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Arrow and bow tools			+	+	+	+	+	+		+	+	+				
Handles and toggles for work				+		+	+	+		+	+	+	+			
Food tools		+	+		+		+			+		+	+			
Knives, snow	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
Knives, men's stickers					+		+	+	+	+	+	+	+	+		
Knives (women's)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Skin and fat scrapers	+		+		+	+	+	+	+	+	+	+	+			
Picks and hooks						+	+	+	+	+	+	+	+	+		
Bag-handles			+			+	+	+	+	+	+		+			
Lance and harpoon points, metal, ivory	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Lance and harpoon fore and loose shafts			+	+	+	+	+	+	+	+	+	+	+	+	+	+
Lance and harpoon butts	+		+			+	+	+	+	+		+				
Throwing-sticks	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

REPORT UPON THE WORK IN THE DEPARTMENT OF AMERICAN ABORIGINAL POTTERY IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By WILLIAM H. HOLMES, *Honorary Curator.*

The department of aboriginal pottery has been enriched during the year by several very important accessions, numbering about 1,500 entries, but including a much larger number of pieces. In previous years the collections consisted to a large extent of modern products, most of which were derived from the pueblo towns of New Mexico and Arizona, but the body of the accessions of this year are prehistoric and represent localities widely distributed over the American continent.

The agencies through which these acquisitions were made are (1) those of the National Museum and the Smithsonian Institution, including donations, purchases, and the products of original research by the agents of these departments, and (2) those of the Bureau of Ethnology through corresponding channels. The bulk of the year's material has been acquired through the agencies of the latter organization.

From the Mississippi Valley and the more easterly sections of the United States collections were made chiefly by the agents of the Bureau of Ethnology, working under the supervision of Dr. Cyrus Thomas. They were obtained from mounds, graves, shell heaps, and from the surface of the ground, and include many pieces of the ordinary aboriginal vases, pipes, etc., mostly of types already well represented in the collection, but of much importance and interest as filling up gaps in the series. In all there are upwards of 400 numbers.

From the pueblo country the most important accessions are of the ancient wares of eastern-central Arizona and western-central New Mexico, and are the product of excavations made by Mr. E. W. Nelson. They consist chiefly of vases and fragments of the coiled and white wares of the earliest-known periods of pueblo occupation and exhibit a number of new forms such as are not found farther north. Mr. James Stevenson secured a number of ancient pieces from the province of Tusayan.

The purchase of two collections of Mexican antiquities has added much to the collections of pottery. A small number of pieces come from the valley of Mexico, but the more important accessions are from

Oaxaca. The latter include a series of ceremonial vases elaborately embellished with figures of Tlaloc and other mythologic personages. A small collection, including both ancient and modern wares, was made in the vicinity of Guadalajara, by Dr. E. Palmer. The ancient pieces are of types corresponding closely to those of Tula and the valley of Mexico.

Important additions were made to our already rich collections from the province of Chiriqui, Colombia. The field-work was done by Mr. J. A. McNiel, and the specimens were acquired by the Museum through purchase and through donation, about 50 fine pieces having been presented to the Museum by Mr. J. B. Stearns, of Short Hills, N. J.

The work of classifying and arranging continued steadily during the year, and such progress was made that in June the hall was opened to the public, a small space only being reserved for the reception and classification of new collections. Careful attention has been given to the placing of the material with a view of avoiding confusion and of making the classification of the ware apparent at a glance. The great wall case is entirely filled with the modern wares of the American Indians, the greater part of the space being devoted to the wares of the pueblo Indians. Beginning at the right, on entering the hall, the two first sections are occupied by the polished black pottery of the Rio Grande pueblos. Following this ware in order are the various products of the pueblos in the Rio Grande Valley, most notable among which are the artistic vases of Acoma. Beyond this, occupying part of the north and all of the west sides of the hall, are the striking products of the pueblo of Zuñi, and on the south are the rich-colored wares of Moki. The modern products are confined exclusively to the wall case. The central case contains about 500 pieces of ancient pueblo ware, chronologically arranged; beginning with the most archaic forms on the lower shelves, ascent is made through the three succeeding groups to the earlier historic forms at the top. The remainder of the floor space is occupied by about twenty ebony cases, in which are placed small selected series of antique vases from Peru, Panama, Central America, Mexico, and the mounds of the Mississippi Valley. Behind the wall case, and extending the entire length, is a space fitted up with shelves, in which duplicates and fragmentary pottery are stored.

The curator has been occupied during the year in preparing a paper on the remarkable collections from the province of Chiriqui. The introductory pages are devoted to the geography, peoples, cemeteries, and to other general topics. The various objects of art are discussed under the three heads—stone, metal, and clay. The body of the work is given to a detailed study of the ceramic art. Especial attention is given to the decorative system of the Isthmian peoples, and the final chapter is devoted to a study of life forms in vase painting.

The study of this group of art products led to an investigation of the influence of textile decoration upon the ornamentation of pottery, and

a second paper was prepared which covers the following topics: Form in the textile art, relation of form to ornament, textile ornament, development of a geometric system of ornament within the art, geometricity imposed upon adopted elements, and the extension of the geometric system to other forms of art. These papers are accompanied by over 500 illustrations, and will appear in the Sixth Annual Report of the Bureau of Ethnology.

It is difficult to obtain a correct statement of the number of specimens in the collection, as much of the ware is in a fragmentary condition.

A very large and important series of vases is still retained in the Archæologic Hall of the Smithsonian Institution. It is expected that during the coming year cases will be built and placed in the pottery court to accommodate representative series of this material.

REPORT UPON THE WORK IN THE DEPARTMENT OF ARCHÆOLOGY IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By Dr. CHARLES RAU, *Curator.*

In the preparation of this report I have found it convenient to take up the more interesting accessions and treat of them by States.

REVIEW OF IMPORTANT ACCESSIONS.

NEW YORK.

The Natural Science Association of Staten Island sent for examination a carving in sandstone representing the head of an Indian, and evidently of aboriginal workmanship (Fig. 1). The head, which was presented to the association by Mr. George F. Kunz, of New York, measures 7 inches in height, and is made from a sandstone bowlder; it never belonged to a complete figure. The carving shows a low forehead, an aquiline nose broad at the base, full lips, and a well-formed chin. The eyes are far apart, and the cheek bones remarkably prominent. It was found in Southfield, Staten Island, at a depth of from 12 to 18 inches in the swamp near the Fingerboard road. A full account of the discovery is given in the proceedings of the above-named association, May 10, 1884.

The head is represented by a good cast in the collection of the National Museum.

NEW JERSEY.

Ten argillite implements of palæolithic type, from gravel-beds at Trenton, were received from Dr. Charles C. Abbott, the well-known discoverer of this class of primitive implements in that locality. Another series of such specimens has been promised by the donor.

Mr. W. H. H. Chambers, of Philadelphia, presented twelve triangular arrow-head-shaped specimens of dark flint, which belonged to a subterranean deposit of three hundred similar objects, discovered on the farm of George Moore, on the south bank of Rancocas Creek, near Lumberton, Burlington County. When plowed up the flint blades were found standing upright in a circle, with the points downward. Fig. 2 represents one of the specimens.

PENNSYLVANIA.

Mr. A. F. Berlin, of Allentown, Lehigh County, presented five rude implements, four cutters, thirteen arrow-heads, and a notched sinker, all found on Lehigh Island, in the Lehigh River, near Allentown. Some of the arrow-heads are of the rare leaf-shaped tanged type (Fig. 3).*

Dr. J. J. Fullmer, of Philadelphia, sent for inspection a grooved stone ax, which he had found in Fairmount Park, in that city. The ax, which consists of a fine-grained sandstone, is remarkable for its length, and for having the rather shallow groove so near to the butt-end that it is difficult to understand how it could have been used with a handle. The groove, moreover, shows distinct traces of wear. This ax has an analogue in certain European stone axes, in which the shaft-hole is very near the butt, and which, when hafted, would have presented the same difficulties of manipulation.

A cast of the specimen represented in Fig. 4 is now in the National Museum.

VIRGINIA.

From Mr. John B. Wiggins, of Chula, Amelia County, were received specimens from an aboriginal mica mine in Amelia County, consisting of fragments composed of earth, charcoal, and mica, and a piece of the kind of stone (trap rock) of which the mauls used in obtaining mica were made. I take the following from Mr. Wiggins's letter accompanying the specimens:

> On examination I find that for acres around the John McCormick mine the ground has been dug over and the surface mica extracted. The method employed in breaking the large quartz rock containing mica was by building fires and heating them, afterwards using heavy mauls made of the same material as the fragment of stone inclosed. I beg to say that the early workers of these mines labored under great difficulties in obtaining the mica, and it must have been very highly prized by them.

A small collection, consisting of a leaf-shaped implement, arrow and spear heads, grooved axes, a stone slab with a mortar cavity on each side, and a fragment of pottery from Massaponax, Spottsylvania County, was received from Mr. Robert P. Bigelow, of Washington, D. C.

A valuable addition to the collection was a handled boat-shaped pot-stone bowl 13 inches long, found 8 feet below the surface on the west bank of the Potomac River, about 7 miles above Washington, in Fairfax County, and presented by Mr. John W. Brock, of Philadelphia. This vessel (Fig. 5) is not finished by smoothing, but left in a rough state, showing the distinct marks of the tools by which it was fashioned.

WEST VIRGINIA.

From the Bureau of Ethnology was received a large collection from different localities in the Kanawha Valley, consisting of rude chipped implements (mostly celts), scrapers, perforators, arrow and spear heads,

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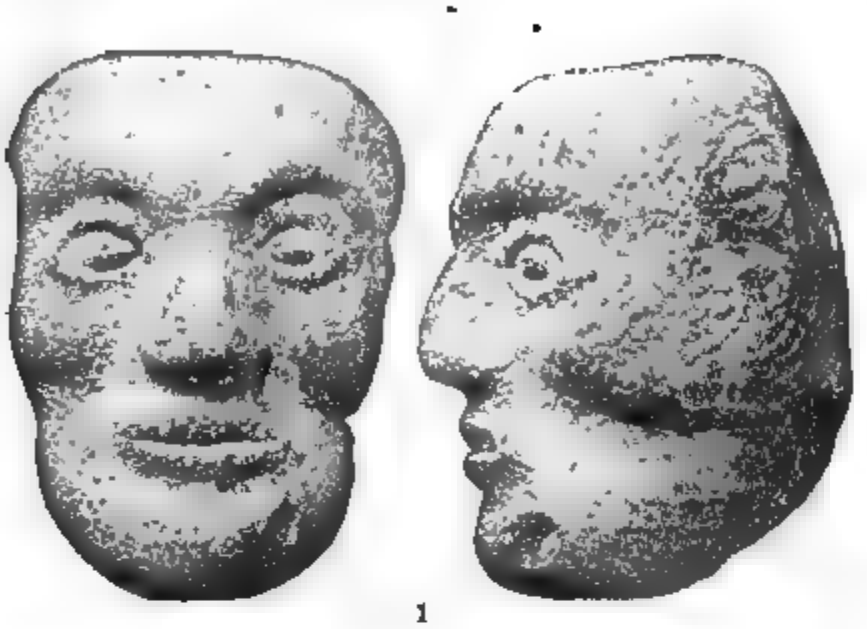
*Most of the received objects are of stone; whenever they consist of another material it is specially mentioned.

PLATE I.



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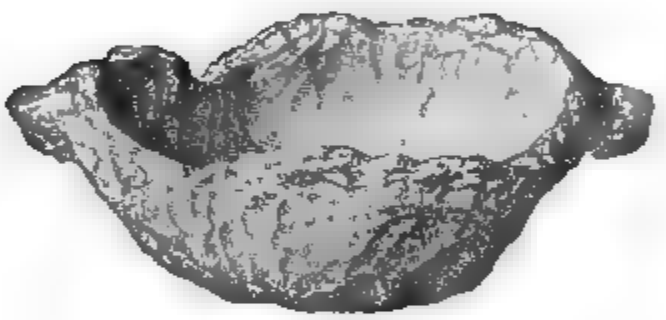

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FIG. 1 Carved Indian head, Staten Island, New York. Catalogue No. 98133. ½
FIG. 2. Triangular arrow-head, New Jersey. Catalogue No. 96740. ½
FIG. 3. Arrow-head, Pennsylvania. Catalogue No. 98304. ½
FIG. 4. Grooved ax, Pennsylvania. Catalogue No. 98043. ½
FIG. 5. Soapstone vessel, Virginia. Catalogue No. 98645. ½

hammer-stones, pit-stones, grinding-stones, cup-stones, stone slabs with mortar cavities, polished celts, small hematite celts, grooved axes, discoidal stones, gaming disks, pierced tablets, ceremonial objects, tubes (one with a flattened and enlarged mouth-piece), stone pipes, bone perforators, bone beads, bears' teeth (notched or drilled), shell beads and other ornaments of shell, and a number of copper wristlets. This collection contains many good specimens.

The Bureau of Ethnology also delivered a collection from "Cemetery Mound," on Smith's farm, Kanawha County, embracing chipped celts (some with polished cutting edges), arrow and spear heads, hammer-stones, pit-stones, pestles, polished celts (some of hematite), grooved axes, stone disks, pierced tablets, fragments of ceremonial objects, paint-stones, a stone pipe, perforated bears' teeth, and a number of unmodified *Unio*-shells.

NORTH CAROLINA.

Dr. J. M. Spainhour, of Lenoir, Caldwell County, contributed a specimen of brown hematite from Caldwell County, in the form of an egg with truncated smaller end. Such specimens may have been the heads of skin covered war-clubs, like those still or lately in use among certain Indian tribes; but it has also been suggested that they were used in some game, or perhaps as targets to be shot at with blunt arrows for the sake of practice. Placed upright on a pole, they would fall down when hit by a missile.

ALABAMA.

From the Bureau of Ethnology: A small collection from a stone grave near Guntersville, Marshall County, namely, split and polished bear's teeth pierced with two holes in the middle, a string of small drilled canine teeth, and spool-shaped objects of copper.

MISSISSIPPI.

From the Bureau of Ethnology was received a collection from a group of mounds and graves, inclosed by an embankment and ditch, in Union County, containing rude chipped implements, arrow and spear heads, scrapers, a large flint digging tool of oval form, hammer-stones, pit-stones, stone slabs with mortar cavities, polished celts, stone disks, beads (of stone), an unfinished ceremonial object, fragments of a stone pipe, shell beads, bone perforators, land-turtle shells (*Cistudo clausa* Lin.), fragments of pottery, charred hickory nuts, part of a brass pendant, a curiously patched ornament of brass (four-sided and pierced), a thin plate of silver with the arms of Castile and Leon stamped on it, and fragments of human skulls and bones.

OHIO.

A fine boat-shaped object of banded slate, flat on one side and pierced with two holes, was presented by Mr. H. C. Duvall, of Washington, D.

C. The specimen had been found in a maize field in Berea, Cuyahoga County, Ohio.

Mr. T. F. Spangler, of Zanesville, presented a collection of one hundred and nine arrow and spear heads, scrapers, etc., from the neighborhood of Flint Ridge, Muskingum County. These specimens—good representatives of forms and materials—were attached to nine serviceable tablets, on which they are exhibited.

From Mrs. D. L. Nielsen, Vermillion, Erie County, were acquired two spear-heads, and an object of porphyritic syenite, pertaining to the class of so called bird-shaped carvings found on the farm of C. Crouse, 1 mile south of Birmingham, Erie County. The last-named specimen is not made in the shape of a bird, but formed alike at both extremities. Specimens of this character are not very frequent.

Mr. J. R. Nissley, of Mansfield, sent for inspection a small collection of choice relics, some of which were reproduced in plaster in the Museum. Among them is a disk of banded slate with a protuberance on each face (Fig. 6). It can be easily perceived that this piece was designed to be made into a ceremonial weapon by cutting out the portions above and below the protuberance, and by perforating the thick part. The original was found on the surface, 6 miles northeast of Sidney, Shelby County.

Through Mr. Gerard Fowke, of Augusta, Bracken County, Ky., was received a collection numbering 1,178 specimens from Flint Ridge, the well-known locality to which the aborigines resorted for quarrying chalcedonic flint of excellent quality, and where they have left the traces of their operations in the shape of numerous pits. Flint Ridge extends through several counties; but the above mentioned collection came from Licking County. It consists of hammer-stones of flint, and quartzite, cores, rude implements (more or less leaf-shaped), cutting and drilling tools, and a large anvil stone.

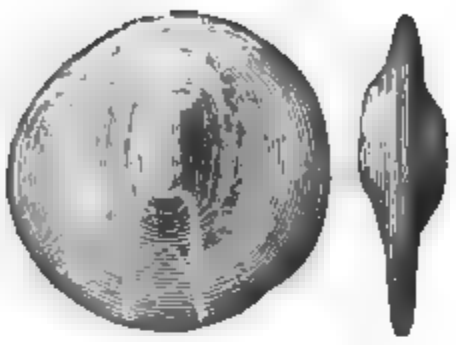
Some of the cores show very distinctly the facets produced by the removal of flakes, and are the best specimens of their kind found north of Mexico, which have ever fallen under my notice.

From the Bureau of Ethnology was received a collection (surface finds) from Butler County. It contains arrow and spear heads, hammer stones, pestles, polished celts, grooved axes, pierced tablets, and a tube of banded slate.

Further: A small collection from "Cemetery Mound," Mount Vernon, Knox County, composed of rude stone implements, bears' teeth flattened on both sides and perforated with three holes, a thin semi-lunar shaped object of copper (much corroded), fragments of human and animal bones, and pieces of a material of chalky appearance, which covered the skeleton.

INDIANA.

From Mr. B. W. Evermann, of Bloomington, Monroe County, were *received* leaf-shaped implements, arrow and spear heads, a polished



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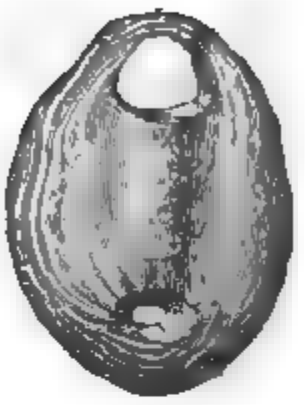

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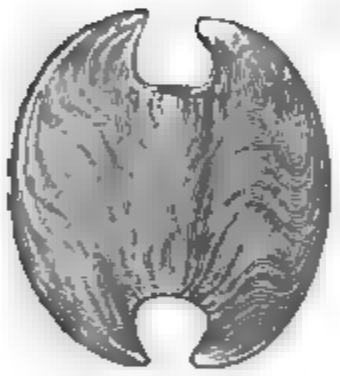

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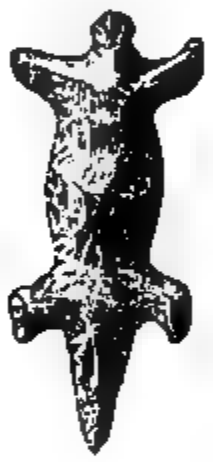

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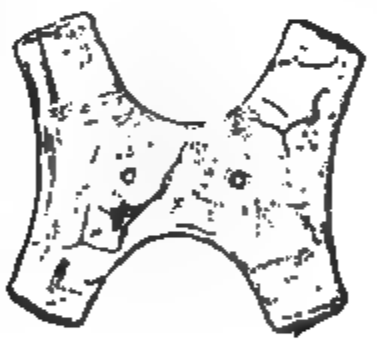

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Fig. 6. Unfinished ceremonial object, Ohio. Catalogue No. 96748. ½
Fig. 7 Unfinished ceremonial object, Indiana. Catalogue No. 96436. ½
Fig. 8. Ceremonial object—finished, Ohio. Catalogue No. 85627. ½
Fig. 9. Lizard-shaped object, Illinois. Catalogue No. 96362. ½
Fig. 10. Copper ornament, Kentucky. Catalogue No. 29 32. ½
Fig. 11. Spade-shaped pipe, Tennessee. Catalogue No. 82280. ½

celt, a large grooved ax, a grooved maul, a pestle, three pierced tablets, one-half of a ceremonial weapon, a bird-shaped object, and a natural formation (clay-iron stone), from Carroll County, and an oval flat pebble of banded slate thickest in the middle, having portions cut out at the smaller ends, with the intention to make it into a ceremonial weapon. This interesting piece (obtained in Howard County) is represented in Fig. 7, and in Fig. 8 is shown the form of a finished object of the same character, received from Ohio in 1879.

A collection from Floyd, Harrison, and Crawford Counties, was presented by Mr. John H. Lemon, of New Albany. It embraces rude and leaf-shaped implements, cutting-tools, scrapers, perforators, arrow and spear heads, polished celts, grooved axes, pestles, and fragments of pierced tablets.

A leaf-shaped implement, arrow-heads, polished celts, a grooved ax, and a rude pierced tablet (mostly good specimens), from Wheatland, Knox County, were presented by Dr. E. C. Black, of Wheatland.

ILLINOIS.

The Museum is indebted to Mr. C. Armstrong, of Carrolton, Greene County, for the loan of a chipped and afterward polished specimen of white jasper, in the form of a lizard (Fig. 9). This object, of which there is now a cast in the National Museum, measures 3 inches in length. It was found on the surface in Walkerville Township, Greene County, on what is known as the Illinois River Bluffs. It may be of ornamental or totemic character.

The Bureau of Ethnology delivered a collection from a mound near Mill Creek, Alexander County, namely: Large rude chipped implements, chipped celts, some with polished cutting edges, a spear head, an irregular polished tablet of pale-greenish fluorite, pierced with two holes, shell beads and other ornaments of shell, bone perforators, drilled bears' teeth, worked stag horn, and fragments of animal bones.

The pierced tablet is a very remarkable specimen.

Further: Arrow and spear heads, a polished celt, a pierced tablet, spool-shaped objects of copper, and a compact earthy mass inclosing bears' teeth (partly notched), and fragments of bones, from a mound near Fountain Bluff, Jackson County.

Further: One hundred leaf-shaped implements of dark flint or hornstone from a subterranean deposit of one hundred and ten, on the farm of John G. Simms, near De Soto, Jackson County. I have not yet learned how the specimens were arranged under ground.

Further: A chungkee-stone (pierced and well finished), two *Unio* shells prepared to serve as spoons, and two thin sheets of copper, one square, with two human figures, with head-dresses, apparently in the act of dancing, stamped upon it, and the other in a less good state of preservation, showing also a human figure similarly produced. These objects came from a stone grave near Bluff Lake, Union County.

KENTUCKY.

Mr. W. Kinney, of Portsmouth, Scioto County, Ohio, presented a copper ornament from a mound in Greenup County, Kentucky. The speeimen is not in its original shape, as represented in Fig. 10, but bent into the form of a lump, doubtless with a view to frustrate further use after its deposition. I have seen in Europe bronze swords bent double with the same intention. Mr. Kinney states as follows:

The copper relic was found in an outlying mound in Greenup County, nearly opposite the mouth of the Scioto River, and one of the group so frequently referred to by Squier and others. This mound is in the first or lower river-terrace, while the main works are on the next. On one occasion half a bushel of these ornaments was found in the same mound and sent to the smelter.

TENNESSEE.

The Bureau of Ethnology delivered a collection from a mound on McGee's farm, Monroe County, namely: Small arrow-heads, polished celts, a pestle, discoidal stones, a very fine large semicircular tanged object (polished),* a clay pipe, a fragment of a stone pipe, drilled bears' teeth, shell beads and pendants, a carved and open-worked shell disk (gorget), cylindrical copper beads, glass beads (European), and two human skulls.

Further: Grooved axes, pierced tablets, bone implements (needles, etc.), shell beads, pin-shaped objects of shell, shell gorgets (disk-shaped), remarkable for the designs engraved on them (spider and human figures of Aztec character), and a rude shell mask (human face) from a mound on Faine's Island, 3 miles southeast of Dandridge, Jefferson County.

Further: Arrow-heads, hammer-stones, stone pipes, bone perforators, bears' teeth, shell beads, pin-shaped objects of shell, and a number of disk-like gorgets and masks (human faces) of the same material. Some of the former show well-executed designs of rattlesnakes, etc. From "McMahon Mound," Sevier County.

Further: Flakes, rude chipped implements, scrapers, perforators, arrow and spear heads, polished celts, grooved axes, pierced tablets, a spade-shaped pipe of chlorite (Fig. 11), bone perforators, shell beads, and a slender straight copper implement, 10½ inches long, square in the cross-section, and tapering to a point at each end.

Further: A large flint digging tool (oval), polished celts and celt-gouges (some very good), and a number of gaming-disks (?), from Lauderdale County.

Further: A large collection from "Citico Mound," on McSpadden's farm, in Monroe County, embracing arrow-heads, polished celts and chisels, hammer-stones, pestles, stone disks, some of them polished,

*I formerly called such specimens "scraper-like implements," but having afterward seen a large number of them, I am now inclined to class them as objects of ornamental or ceremonial character.

pierced tablets, stone pipes, a fragment of a large pot-stone vessel, pieces of red mineral paint, drilled bears' teeth, bone perforators, shell beads and pendants, pin-shaped objects of shell, shell masks (human faces), clay vessels ornamented with raised figures, incised lines, etc., and human skulls and bones.

Mr. Edward D. Hicks, of Nashville, sent to the National Museum three chipped flint objects, remarkable for large size and unusual forms, namely: A sword or truncheon-like article (Fig. 12), and an implement (?) formed at one end like a crab's claw (Fig. 13), both from Humphreys County. Also, a nearly circular disk (Fig. 14), measuring 9 inches in major diameter, and chipped to an edge around the circumference. This specimen, found in Stewart County, differs in make from the disk-like flint articles found in deposits. These three objects, of which casts were taken in the National Museum, are surface finds.

Large specimens of gray flint, more or less analogous in form to those just mentioned, are in the Peabody Museum at Cambridge, Mass. They were likewise found in Humphreys and Stewart Counties, in mounds and on the surface.

MICHIGAN.

Mr. D. S. Carvin, of Lyons, Fulton County, Ohio, presented a platform pipe. It consists of the mottled stone which forms the material of many of the pipes in the Squier and Davis collection, now in England. It was found in a maize-field in Berrien County, Michigan.

WISCONSIN.

Two drilled bears' teeth, two bone ornaments, two small sheets of native silver, shaped by beating, and six cylindrical copper beads from a mound at Warner's Landing, Vernon County, were presented by Dr. J. L. De Witt, of Newton, Vernon County. The pieces of sheet silver are of special interest, being the first specimens of this kind given to the Museum.

From the Bureau of Ethnology were received a leaf-shaped implement, fragments of burned bones, a copper or brass kettle, and a number of silver bracelets, gorgets, ear-rings, etc., from a mound in Crawford County. The objects evidently accompanied an intrusive burial.

ARKANSAS.

From the Bureau of Ethnology were received small arrow-heads, hammer-stones, chipped celts with polished cutting edges, polished celts, mullers, grinding-stones, polishing-stones, gaming disks (?), bone perforators, and pieces of worked stag-horn from an ancient Indian burial ground at Bradley's Landing, Crittenden County.

Further: Rude leaf-shaped implements, small arrow-heads, perforators, hammer-stones, a polished celt, a semi-circular tanged object

(polished), a large quartz crystal, a bone perforator, and fragments of animal bones from a mound in Pulaski County.

OREGON.

Mr. Charles Aldrich, of Webster City, Hamilton County, Iowa, presented a well-shaped stone pestle with a ring-like projection below the tapering end. It was found near Grant's Pass, Josephine County, Oregon.

ARIZONA.

Mr. J. H. Carlton, of Pima, Graham County, presented a flake of chalcedony, arrow-heads, hammer-stones, grooved axes, mauls, rubbing-stones, a metate, a pestle, a small mortar, arrow-shaft straighteners, a polishing-stone, a pebble for smoothing pottery, a small paint muller, an anvil-stone of cylindrical form, a conical stone pipe, a pierced stone disk, shell ornaments, quartz crystals, a piece of unworked turquoise, a clay bowl, and fragments of pottery. The objects were all found in Graham County.

NEW MEXICO.

Mr. E. W. Nelson, of Springerville, Apache County, Ariz., sent a collection from ruins on the headwaters of the San Francisco River, New Mexico, consisting of stone perforators, grooved axes, mortars, a pestle, a grinding-stone, rubbing-stones, arrow-shaft straighteners, perforated cylindrical paint-stones, rock crystals showing use at the apex, fragments of red and green mineral paint, stone carvings in human and animal forms, bone awls, a bone whistle, pendants and beads of stone, shell and pottery, including one of turquoise, and two human skulls. The most remarkable piece in this collection, however, is a sandstone slab, nearly square, with rounded corners, upon which is carved in relief a rather conventional figure of a turtle. It is represented in Fig. 15.

From the same and the same locality, hammer-stones, grinding-stones, pestles, grooved axes, paint mortars and mullers, "tanning-stones," one-half of a stone disk, fragments of a stone plate with many bi-conical perforations, a stone carving representing the head of a coyote, a stone carving in the shape of an owl, stone tubes and pipes, a small arrow-head, twenty-four flat pierced pendants of turquoise, two of which are represented in Figs. 16 and 17, a number of fragments of turquoise pendants, bone perforators, fragments of a bone spear-head, a bear's claw, shell beads and other ornaments of shell, a truncated marine shell (*Agaronia testacea* Lam.), a small brass bell, a nugget of native copper, a piece of graphite, and pieces of red and green mineral paint.

ALASKA.

Mr. J. U. Johnson, of Fort Alexander, presented a spear-head-shaped knife-blade of slate, two polished celts, and three adzes from Alaska.

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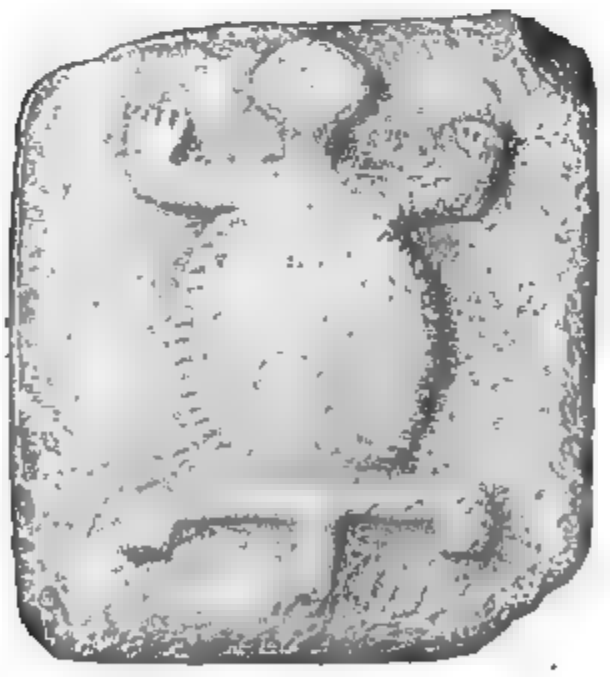

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FIG. 12. Sword-like chipped flint implement, Tennessee. Catalogue No. 98665. ½
FIG. 13. Chipped flint implement—crab's claw, Tennessee. Catalogue No. 98664. ½
FIG. 14. Chipped flint disk, Tennessee. Catalogue No. 98663. ½
FIG. 15. Sandstone slab, with figure of turtle in relief, New Mexico. Catalogue No. 98715. ⅛

MEXICO.

From Mr. L. H. Aymé, of Oaxaca, was acquired a large collection, consisting of obsidian flakes and cores, a hammer-stone, polished celts (one 11 inches in length), polishing-stones, implements with two flat, deeply-striated faces (Fig. 18),* small stone pendants, a large stone slab with deep notches on one edge, a fragment of a pestle, a well-polished disk-shaped ear-pendant of jade (pierced near the rim), fragments of worked alabaster, a piece of stucco, beads made of entire shells either pierced with a hole or truncated at the apex, a large pierced shell (*Strombus*), a shell bead, a shell disk with central hole, fragments of shells, and a large number of calcareous pebbles of unknown use. Further, a number of stone carvings; namely, two large human figures (one very well executed), a human head with widely-opened mouth (part of a figure), a tiger's head (part of a figure), and small squatting figures (human) pierced for suspension.

GUATEMALA.

Mr. Miles Rock, of Washington, D. C., presented a boulder with a face rudely carved on it from the ruins of Saculeo, near Huehuetenango, a place supposed to be the ancient capital of the chiefs of the Mam Indians; and also the greater part of a stone disk, exactly a foot in diameter, having carved on it in relief a human head with an elaborate head-dress. It may be intended to represent the Sun. This specimen came from an altar in the ruins of an ancient temple on the summit of Cerro Ixbul, 40 miles southeast of Comitan, Mexico.

NICARAGUA.

Mr. W. W. Evans, of New Rochelle, Westchester County, N. Y., sent a large block of tufa, to all appearance of volcanic origin, which shows two impressions of small human feet, evidently produced while the tufa was in a plastic state. The material replaced by the feet has risen and forms a kind of ridge around the tracks. The history of this highly interesting piece is not yet known, but will soon be communicated.

UNITED STATES OF COLOMBIA.

By Mr. J. A. McNiel, of Panama, was sent a large collection from Indian graves of Chiriqui, State of Panama. The collection is composed of trimmed flakes, arrow and spear heads, chisels, polished celts, metates of various shapes (some in the form of animals), rubbing-stones, baking-plates, a human stone figure (female), a human figure rudely

*These stones resemble the wooden bark-beaters used by the South Sea Islanders in making tapa-cloth, and probably also were used by the Mexicans for making bark cloth or paper. I was informed that the people in Mexico employ at present these stones, which appear to be frequent, for crushing chilli. This, however, may be a secondary use.

carved from a boulder, two large stone slabs showing in relief, respectively, the figure of a monkey and of an alligator, and five fragments of metates (heads of animals). Some of the celts are of very elegant form, as shown in Fig. 19, representing one of them. The arrow and spear heads chipped from flakes of flint and jasper frequently show the form of a three-sided pyramid. This form seems to be peculiar to Chiriqui, on the western continent, but it also occurs in greater perfection in Denmark and Sweden. A Chiriqui arrow-head of jasper is represented in Fig. 20.

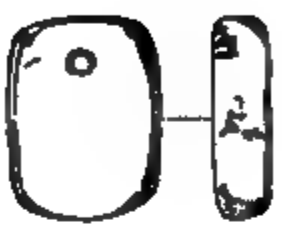
WEST INDIES.

Mr. F. A. Ober, of Beverly, Mass., presented a collection from the Island of Nevis. It consists of four polished stone implements of remarkable forms, and apparently designed for crushing and smoothing purposes, three pestles, a polishing-stone, a fragment of a jade celt, and two celts made of shell.

Messrs. Thomas Lee and Willard Nye, jr., connected with the U. S. Commission of Fish and Fisheries, obtained two polished celts on Abaco Island; a polished celt, a rubbing-stone, and a fragment of worked bone on New Providence Island; three polished celts, a chisel, a small drilled pendant of fine workmanship (perhaps jade), seventy fragmentary human bones, embracing skull and jaw bones and other parts of skeletons, and fifteen pieces of smooth pottery, from a cave on Watling Island.

ROUTINE WORK.

The entering of specimens has been performed according to the method followed in all departments of the National Museum. In the general catalogue the running number of the specimen is noted, together with the private number, if there is one, and its character briefly indicated; there are further mentioned the locality where the object was obtained and the name of the donor or person from whom it was acquired; lastly, the date of the entry is given. This mode of recording would suffice for certain classes of natural objects, and, indeed, suffices for such stray antiquities as are simply taken from the surface; but it is far from supplying the data required for archæologic specimens found in graves, mounds, caves, shell-heaps, camping-grounds, deposits, etc.—in short, under circumstances calculated to elucidate the modes and customs of those by whom the objects were left. In such cases all attainable information contained in letters, or orally communicated, is carefully noted in the "reference-book," which thus forms the supplement to the general catalogue—an archive affording the means of learning the history of many single objects and collections exhibited in this department. Whenever an entry is made in the reference-book, the page on which it is to be found is indicated in the last column of the general catalogue. The data recorded in the reference-book cover a period of several years.



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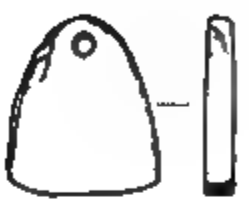

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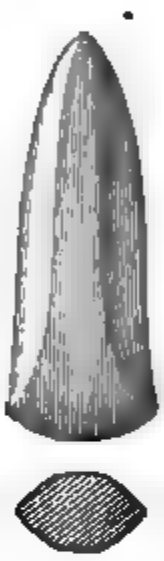

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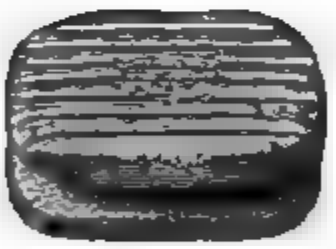

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FIG. 16. Turquoise pendant, New Mexico. Catalogue No. 98256. ½
FIG. 17. Turquoise pendant, New Mexico. Catalogue No. 98256 a. ½
FIG. 18. Polishing-stone or bark-beater, Mexico. Catalogue No. 98279. ½
FIG. 19. Polished celt, Chiriqui, United States of Colombia. Catalogue No. 98555. ½
FIG. 20. Jasper arrow-head, Chiriqui, United States of Colombia. Catalogue No. 98477. ½

The specimens handed to my care are carefully examined, and the best and most characteristic set apart for exhibition. Duplicates which can not in any way add to the value of the collection receive a catalogue number, but, instead of being exhibited, are placed in drawers and reserved for exchanges. This mode of discrimination, however, is chiefly applied to the numerous specimens—mostly of chipped stone—which are found on the surface, but hardly ever to small or large collections of artefacts and human or animal remains obtained from graves, mounds, shell-heaps, caves, etc. Such objects, even when insignificant as specimens, are generally kept together and exhibited as a whole.

I have for years followed a dualistic system in arranging the antiquities of this country. There is, as I stated in my report for 1884, a large *general* collection (mostly exhibited in table cases), which consists of relics of chipped and ground stone, of copper, bone, horn, shell, clay, and, to a small extent, of wood. These objects have been grouped according to material, and then classed under such denominations as their forms indicated or suggested, and with strict regard to the transition or evolution from simple to more developed forms. This arrangement offers to the intelligent visitor an opportunity to take in at one glance, as it were, the whole culture of the prehistoric North American, as far as it can be represented by visible tokens.

There are, secondly, the before-mentioned *special* or *local* collections, composed of North American articles found in *one* locality—a mound, grave, artificial shell-deposit, etc. These collections are designed to show the difference in the mechanical acquirements and modes of life of the people formerly inhabiting the various parts of this country.

While comparatively few additions are made to the general collection, which as it is fully serves its purpose, the number of special collections is constantly increased, and thus, in the course of time, every section of North America will be represented. The collections in question, of course, vary much in extent; they some times only fill a tray, but occasionally occupy several shelves of an upright case. Ultimately they will be arranged geographically.

The observations thus far made relate to collections from portions of this continent north of Mexico, Central and South America, Japan, etc.; and a representative series of prehistoric antiquities from Europe.

In the course of this fiscal year 119 special collections, small and large, have been placed on exhibition. By far the greater number (88) were delivered by the Bureau of Ethnology. The others are contributions or acquisitions from private persons. The more important ones have been mentioned in the first section of this report.

The number of duplicate specimens sent during the year to individuals in exchange for objects received in this department, or in others, was comparatively small. A grooved stone maul from the Moquis, Arizona, was sent to C. M. Sawyer, Mechanics' Falls, Androscoggin County, Maine. The Rev. Mr. Kessler, Magdeburg, Prussia, received

a collection of relics, embracing arrow and spear heads, a polished celt, a grooved ax, and fragments of pottery; 65 specimens in all. A grooved polished stone hammer from Arizona was forwarded to O. P. Rodgers, Marengo, McHenry County, Illinois. To J. P. MacLean, Hamilton, Butler County, Ohio, were sent five casts of an incised stone tablet found in a mound at Waverly, Pike County, Ohio.

Many persons visiting the department have taken notes and asked questions bearing upon the antiquities there exhibited, and all desired information has been promptly given. Such inquiries, it may be presumed, were chiefly made for the sake of self-instruction, but probably also in some cases with a view to literary utilization. I had myself constantly occasion to re examine certain groups or series of specimens, being engaged in the composition of an illustrated work on North American antiquities, which is designed to serve as a guide to visitors of the department, and will bear the title "A Classification of the North American Prehistoric Relics in the U. S. National Museum." More than half of it is in manuscript, and an artist is engaged in making the drawings with which it will be illustrated.

The present condition of the collection is given in the following tabular statement:

TOTAL NUMBER OF SPECIMENS ENTERED IN THIS DEPARTMENT.

Exhibition and study series	40,281	
Duplicates	8,482	
		48,763

RECEIVED FROM THE BUREAU OF ETHNOLOGY.

From pueblos in New Mexico and Arizona for the years 1880 to 1882	2,695	
From mound explorations, etc.:		
For the year ending June 30, 1883	4,285	
For the year ending June 30, 1884	6,436	
For the year ending June 30, 1885	3,135	
		16,551
Total number of specimens		65,314

TOTAL NUMBER OF SPECIMENS RECEIVED DURING THE YEAR (INCLUDED IN THE ABOVE TOTAL).

Exhibition and study series	2,667
Duplicates	84
Total	2,751

REPORT ON THE SECTIONS OF FOODS AND TEXTILES IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By ROMYN HITCHCOCK, *Acting Curator.*

In accordance with your suggestion that I should prepare a report covering, in a general way, the period of my connection with the Museum, I have endeavored to give, in a condensed form, a review of the work done, and a statement of the present condition of the collections in my charge. The different divisions of work assigned to me cover so large a field that it has been impossible to give particular attention to all of them. My work has, therefore, been mainly confined to the two sections of textiles and foods. In addition to these I have received and classified material belonging to the following sections, as enumerated in the "Scheme of Museum Classification" published in the Appendix to the Proceedings of the Museum for 1881, viz:

12. The elements and their combinations, chemical collections.
21. Preparation of food-stuffs, narcotics, etc.
22. Distillation, manufacture of perfumeries, etc.
23. Oils, fats, soaps, and waxes; their preparation and use.
24. Gums, resins, glues, cements.
25. Pigments and dyes.
26. The chemical manufactures and their products.
29. Fibers, cordage, textile fabrics, needle-work.
30. Paper and its manufacture.

I have also taken charge of the Smithsonian collection of philosophical apparatus, which is on exhibition in the north hall.

In a communication from you dated October 13, 1885, you expressed a desire that I would "take charge of all technological material, especially raw materials and products not otherwise already assigned," and stated that "the greater portion of this will doubtless come to you permanently, as soon as the departments having an interest in such material are developed." Accordingly, I have endeavored to catalogue, classify and preserve a great mass of material that it would be impossible for one curator with a single assistant to study, label and prepare for exhibition. That material, however, is available for use at any time, and will some day be of great value to the Museum.

In glancing over the names of the sections mentioned above, it may seem that they include rather a heterogeneous collection, but with the

exception of the section of fibers, etc., it will be seen that they may all be included under pure and applied chemistry, and are, therefore, more or less directly connected, although very properly separated in different sections for museum purposes.

The section of textiles has engaged my attention most fully during two years. My connection with the Museum dates from November, 1883, when an office in the east tower, on the ground floor, was assigned to me, Mr. E. H. Towne, who had previously been engaged on the collections as preparator, acting as assistant. A few specimens of textile fibers and fabrics were then on exhibition, but without labels, in the west hall. A large number of specimens of foods in bottles were on exhibition in the northwest range, but very imperfectly classified, and not selected with discrimination. A large collection of fibers and fabrics, mostly from the Centennial exhibition of 1876 was still unpacked and required attention. These were immediately prepared for study. The different divisions of work will now be separately reviewed.

The early work in this section was very much retarded, and some of it was not very perfectly done, so that it required subsequent revision, owing to the want of necessary books of reference. A sectional library was soon provided, which has served very well, but even now some very useful books of reference are not available. It was soon found that much of the accumulated material was of little value, owing to deterioration by long keeping, the loss of marks for identification, and other causes. Gradually such specimens were eliminated, and the plan has been followed throughout the section to discard all specimens of even doubtful identity, except when it was thought their identity might be established in future, in which case, when the specimen was a good one that might not be easily replaced, it was catalogued and held in reserve.

Four series of specimens are provided for in this section, viz: exhibition series, study series, reserve series, and duplicate series.

This series includes all specimens mounted for exhibition. Owing to the limited space on the Museum floor the mounted specimens are not all on exhibition at the present time, but the unit boxes containing them are ready for display when space permits. Every specimen in this series is provided with either a written or a printed label.

A system of marking the catalogue cards has been adopted which indicates at a glance when a specimen is in the exhibition series and when a label has been written for the printer. The mark ⊙ on a catalogue card indicates that a specimen is mounted for exhibition and if followed by a check, thus ⊙ ✓, the label for printing is written.

The system of classification proposed some time ago in one of my reports has been carried out in a general way, but the collection is so broken up by the necessity of storing specimens that should be shown, that the system can not be strictly adhered to. Beginning at the en-

trance of the court (the collection is now in the northeast court, occupying about one-half of the floor-space), the visitor first comes to the textile materials used in their natural condition, such as rough barks, made into ropes by Indians and primitive tribes in different countries; esparto, madé into coarse mats in Spain; palm-leaves, woven into baskets, hats, etc. Then may be seen varieties of tree-down, often known as tree-cotton, including the *paina* of Brazil in variety, showing how the down occurs in the seed-pods, and the *pulu* of the Sandwich Islands. These materials are used, without preparation, for stuffing. Then follow varieties of fibers extracted from stalks and leaves of plants, the coarser ones used for ropes, the finer for yarns suitable for knitting and weaving. Among these is a good series representing the ramie industry, which may become of considerable importance to this country; collections of New Zealand flax, common flax, agave fibers in great variety, and many others, leading up to cotton. The manufacture of cotton thread is represented by a case of eight unit boxes, mounted especially for the Museum by the Willimantic Linen Company, and is one of the best exhibits in the series. Following cotton come fibers from the animal kingdom, horse-hair, wool, and silk.

Some attempt has been made to prepare a good display of spinning and weaving appliances, but the space is too much restricted to permit of proper display of what apparatus we have. A case is filled with spinning-wheels, reels, etc., which were in use many years ago in the preparation of flax, cotton, and wool yarns for hand-looms, but it is not as attractive or instructive as it should be. It is interesting to compare the primitive implements used for the same purposes in different countries, examples of which are shown. For instance, there is a hand reel of the present day from Siam, which is precisely like the common English reel, except that in the former the cross-pieces are in one plane, while in the latter they are placed at right angles. This very slight change makes the English reel of a century ago far more convenient to use than the one now in use in Siam.

Among the looms may be seen some very excellent specimens from various parts of the world. Perhaps the simplest are those still in use by the Indians of North America, of which, however, there are several varieties. In one case a fine Pimo Indian loom, collected by Dr. Edward Palmer, is well shown and described. A Moqui loom is also shown, but not in as good condition. Quite recently a Zuñi loom was set up and some weaving done upon it by the Indian girl Wawah, thus enabling me to follow the successive operations and understand them better than has been possible from written descriptions. A loom of the Talamanca Indians, of Costa Rica, with specimens of cloth, is of interest. A loom from the Ainos, of Japan, is also of special interest in connection with the Indian loom, owing to certain distinguishing features in the device for opening the warp for the passage of the shuttle.

A number of photographs of the Indian girl Wawah engaged in the

various operations of spinning, preparing loom and warp, and weaving, were taken, and are used to illustrate the methods of work among the Zuñis.

The study series of fibers includes authentically named specimens intended for microscopical examination. Appended to this report is a special article on preparing microscopical mounts of vegetable textile fibers. The study series is valuable, indeed, absolutely necessary, as it is not unfrequently required to use small portions of fibers for comparison with others for identification. Occasionally requests for typical specimens of fibers are received, which have been supplied from the study series. It is expected that specimens will be sent to the Museum for identification from time to time. The study series will afford a means of identification probably better than can be elsewhere found. It is not, however, by any means complete. Every distinct fiber in the textiles collection is represented in this series, but not every fiber in use is so represented.

An alphabetical catalogue of objects in the study series is kept on cards in the office of the curator and a list has been prepared and is published as an appendix to this report.

When small specimens of textiles are received that seem to possess a scientific rather than popular interest, or which are for some reason not suitable for exhibition, they are placed in this series.

The reserve series includes specimens of value for purposes of exhibition, which can not be immediately mounted. When such specimens have been catalogued they are marked "reserve," and placed in drawers in numerical order, and the fact is noted on the catalogue card. If a portion is desired in the study series it is selected at the time and so indicated on the catalogue card.

The duplicate series includes those specimens available for exchanges. These are stored in drawers or in storage boxes. A special series of cards, numerically arranged, gives a list of the specimens in this series and indicates their location. The specimens in general storage, however, are enumerated on special storage catalogue cards, bearing the storage number of the boxes and a list of their contents, so that any specimen can be obtained without delay.

An alphabetical list, arranged by both common and botanical names, of all the specimens in the collection, including all in the four series enumerated above, has been prepared, and will some day be submitted for publication.

The arranging of the textiles collection in accordance with the plan outlined above has been perfected, and its advantages are apparent in the ease with which new material can be handled. Immediately a new specimen is received, the general alphabetical list shows whether it is new to the collection or is from a new locality. Its value can be determined at once, and its place in one of the four series assigned to it. Thus an accumulation of useless material for exhibition is avoided, and *the collections* are maintained in good order.

SECTION OF FOODS.

In this section it is intended to show specimens of foods that may possess special interest, especially such as are used by primitive peoples and in foreign lands. A more important feature, however, will be to afford information concerning the nutritive value of various articles of food in daily use, and to aid in the dissemination of knowledge upon the important subject of nutrition. The relation between the cost of an article of food and its value for nutritive purposes is an important consideration, especially for the poorer classes of laboring people. It has long been a matter of pride with us that the laboring classes in the United States live far better than those doing the same work in foreign countries. But they are enabled to do so because they receive higher wages and it seems not improbable that the growing competition between nations will require greater economy in labor here, and it will then be necessary for the poorer classes to exercise more economy in living. It becomes, therefore, very desirable to learn not only what are the most nutritive foods, but, a matter of greater practical importance, what are the cheapest and best foods to buy. Also, what are the best combinations of food, and how these should be prepared. Some of these questions have been carefully studied by Prof. W. O. Atwater, and the results of many analyses made by him are now available for use in this section of the Museum. As a matter of fact, there is no doubt our laboring classes are living extravagantly and that by intelligent direction, involving instruction in the art of cooking as well as in the selection of proper food, their expenses can be considerably reduced without detriment to the excellence of the food provided.

The collections in this section are not yet sufficiently advanced to demonstrate these purposes in view. It will be the work of considerable time, but a beginning has been made in two cases now on exhibition. The first of these illustrates the chemical composition of the human body, showing on one side the elements found in the body, in their relative proportions; on the other side the principal compounds. In the second case are shown specimens illustrating the daily income and expenditure of the body, and the quantity of various constituents of food required to supply the waste. The constituents of a ration for one day are shown and the transformations they undergo in the body are described. The composition of a loaf of bread is also illustrated by specimens. These examples will indicate the practical and instructive tendencies of the exhibits in this section.

A collection of foods used by the Indians of North America is now arranged, including all the specimens now on hand, and occupies two full cases. It is not complete and can not be made so until a competent and experienced collector, like Dr. Edward Palmer, who is better acquainted with this subject than any other person, is commissioned to travel among the Indians and supply the deficiencies. It is very desirable that this should be done as soon as possible.

Among the specimens of general interest may be mentioned a case of Japanese foods received from the Department of Education at Tokyo, which includes many curious products. Another case is filled with preparations of animal foods from various localities. Another case contains farinaceous products.

There is still in reserve a great variety of food-products, some of which are useful for display; others will be eventually discarded. Time has not permitted the arranging of these.

Little has been done in the section of chemical manufactures, but such specimens as have been received have been cared for and a few of them placed on exhibition. An excellent series of chemical elements and compounds will soon be systematically arranged for display, probably during the month of July.

It is intended to represent in this section the chemical industries of the country as fully as possible by museum specimens and photographic views of processes and apparatus.

A desideratum in connection with the work of this division is a laboratory equipped with the necessary apparatus for chemical work. It need not be large or expensive but it should afford facilities for a certain amount of analytical work, both qualitative and quantitative, and especially for the preparation of compounds that are required in the exhibits. The want of such a laboratory has been keenly felt not only in this but also in other sections in my charge.

A considerable quantity of material, to be distributed among the various sections not yet provided for on the floor of the Museum, has been received. It is all classified and stored on the north balcony, where it is available for use at any time. This includes gums, resins, dyes, pigments, oils, fats, soaps, waxes, perfumery, essences, and other articles.

The following table shows the present extent of the collections:

	Specimens.
Textiles on exhibition	1,199
Textiles in study series	317
Food products on exhibition	594
Chemical products on exhibition	659
Total	2,769

REPORT ON THE SECTION OF STEAM TRANSPORTATION IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By J. ELFRETH WATKINS, C. E., *Honorary Curator.*

The section of steam transportation was organized and placed under my charge on the 13th of June, 1885.

It is the design of this section to illustrate by drawings, models, relics, etc., the birth and development of steam transportation in America, both on water and on land, so that the humble mechanic who visits the Museum may be able to take away with him an intelligent idea of the successive steps in the progress of invention of steam appliances, that have led up to the ocean steam-ship and the fast passenger express and powerful consolidated freight locomotives of to-day.

It seems indeed proper that an attempt should be made to preserve the history of this department of industry, which has had such an immense influence upon the growth of our nation and the development of our civilization during the nineteenth century.

It is estimated that up to January 1, 1886, 130,000 miles of railway had been built, and $7,500,000,000 had been invested in railway stocks and bonds in the United States, and over $2,000,000,000 in steam-ships touching at American ports and steam-boats navigating inland streams, a total of nearly $10,000,000,000—ten billions of dollars.

In 1883 the total taxable property, real and personal, as assessed to the thirty-eight States, was $17,026,307,374.*

The census tables of 1880 give the following enumeration of people in the United States who are connected with the transportation industry:

Steamboatmen, stewards, etc	55,536
Railway officials, clerks, and employés	250,458
Express officials, clerks, and employés	14,860
Transportation companies and employés	9,702
Total	330,556

Of the 17,392,000 persons engaged in all branches of labor, trade, manufacture, and professions in the United States in 1880, the number

* See Spofford's American Almanac, 1884, page 105.

of employés of railway, express, and transportation companies was exceeded only by the following classes:

1. Agricultural laborers, who numbered	3,323,876
2. Farmers and planters, who numbered	4,225,945
3. Domestic servants, who numbered	1,075,653
4. Laborers, unclassified, who numbered	1,859,223
5. Carpenters and joiners, who numbered	373,143
6. Clerks in stores, who numbered	353,444

As Nos. 1 and 2 are practically one class, and No. 4 is no class, railway and transportation employés are the fifth class in point of number.

Of the 55,000,000 of inhabitants of the United States, what class is not directly interested in the progress of invention, whereby we enjoy speed, comfort, and safety, in transportation by steam over our railroads and water-courses?

The following preliminary scheme for the organization of the section was suggested by the curator, and indorsed by the Assistant Secretary, in October, 1885. It will be modified from time to time as circumstances may permit.

PRELIMINARY SCHEME OF ORGANIZATION.

To obtain originals or models of early steam-boats, locomotives, track, cars, etc., with history enough of each to make a label. Show early experimental track and short pieces of various patterns of rail.

To obtain drawings or photographs of early steam-boats, locomotives, etc., to be arranged on hinged frames, in accordance with the system now in use in other sections and departments of the Museum.

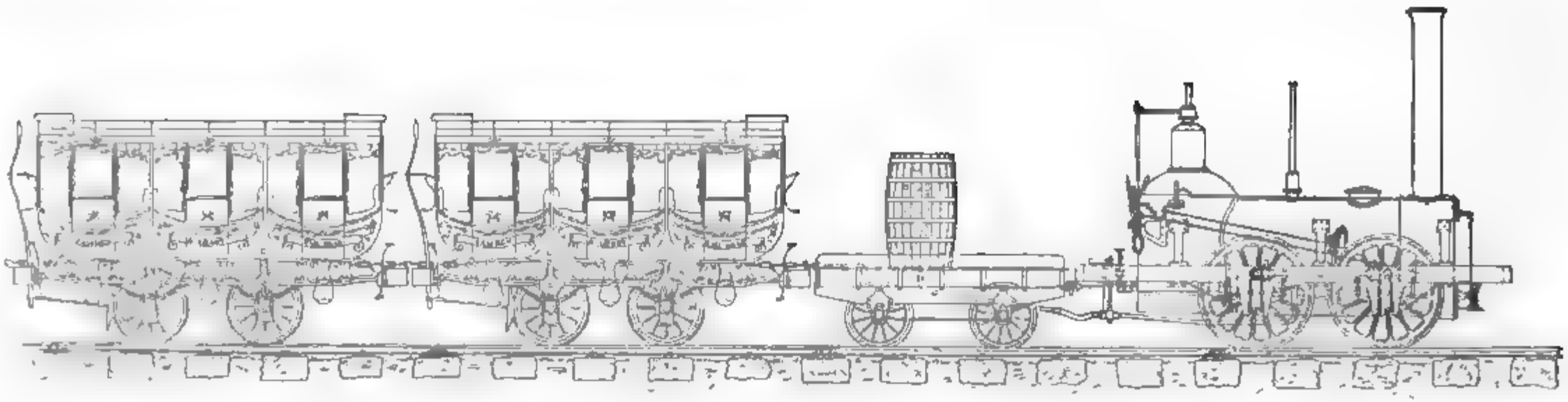
As soon as practicable, to issue a circular letter, under the authority of the Smithsonian Institution, giving an outline of the scheme, to be forwarded to engineering and scientific societies, railway officials and employés, urgently requesting their co-operation and suggesting the formation of a National Railway Historical Society.

When the section has made some progress, to issue a bulletin giving a general history of early steam-boats and locomotives and the birth of the American railway system, as exemplified in the collections of the National Museum.

To create a sectional library, which shall contain all books, magazines, pamphlets, obtainable that bear on the history of American railways, and in this section of the National Museum to keep a catalogue containing the names of the authors, title of book, publisher, etc., with directions as to where such book may be found, for the benefit of such persons as may be interested in these subjects.

In connection with the history of transportation in general, to show pack horses, freight wagons, stage coaches, early canal boats, post boys, mail coach, etc.

To show by models, drawings, and relics the develpment of the sta-



LOCOMOTIVE "JOHN BULL" AND TWO PASSENGER CARS. THE FIRST STEAM RAILWAY TRAIN IN THE STATE OF NEW JERSEY, 1831.

Inspected by the Legislature of the State of New Jersey, November, 1831, to decide whether the steam privileges asked for by the Camden and Amboy Railroad Company should be granted.

tionary steam-engine and the beginning of invention of the steam-boat, locomotives, passenger and freight cars, etc.

It was not until November, 1885, that any space in the Museum was assigned to this section. In that month the locomotive "John Bull," engine No. 1, Camden and Amboy Railroad Company, 1831, was placed upon exhibition. While by no means the first, this is the oldest locomotive in America. It ran the first train on any road owned, leased, or operated by the Pennsylvania Railroad Company, and was presented by that corporation to the National Museum. The locomotive in Pl. I is drawn from a tracing made by Isaac Dripps, of Philadelphia, the first person on this side the water to run No. 1, from the original working drawing, which accompanied this locomotive from the works of Stephenson & Company, Newcastle-on-Tyne, England, in 1831. This tracing is on a reduced scale; the tender is from a drawing by Mr. Dripps, and the two cars are from a cut which was used by the manufacturers, M. P. & M. E. Green, of Hobokon, N. J., as an advertisement in 1832. The whole was put together and was reduced to the same scale under the supervision of Mr. Dripps. A section of the original track, consisting of stone blocks, iron rails with a base, iron joint "tongues" (Pl. II, fig. 1), "hook-headed spikes" (Pl. II, fig. 2), rivets (Pl. II, fig. 3) through the stem of the rail, has been presented to the Museum. This relic was originally collected by the late Col. I. S. Buckelew, for many years superintendent of the Amboy Division of the Pennsylvania Railroad until his death, November 24, 1884, and given by him to the curator, who has presented it in his name to the Museum. It is a most valuable relic, since it exemplifies the earliest period of the inventions which have since developed into the American system of permanent way.

In 1831 the track of this company was unique. After a lapse of half a century the cross-tie has superseded the stone block, it is true, but the rail with the base, the "hook-headed" spike, the "tongue" lengthened and strengthened into the splice-bar or fish-plate, and the "rivet" changed into a bolt and nut, is found in all standards of American track. This section of track was examined by the late Ashbel Welch, C. E., past president of the American Society of Civil Engineers, who was present at the opening of this portion of the road, and afterwards became chief engineer and president of the system to which the Camden and Amboy Railroad was attached. From memory and notes he pronounced it and the description authentic.

Sections of "fish-bellied" rail, with chair, imported from England in 1832 by the New Jersey Railroad Company, and laid near Newark, have also been obtained, together with cross-sections of various patterns of rail experimented with between 1835 and 1845.

By a careful search through the files of the Patent Office for plans of switches, frogs, signals, splices, etc., in which work I received the

courteous assistance of the examiners in charge, quite a number of drawings which accompany the patent specifications were found. These are of great interest, showing the fluctuations of thought at various intervals. It is intended to arrange these for exhibition at some future time.

The loss of models, etc., by the fire of 1877, is to be deplored, as a wide field for investigation was destroyed by this occurrence.

Lack of time has prevented me from giving much attention to steam-boats and marine engines. While the collection is meager, it is a nucleus which, I trust, will attract the attention of marine engineers and steam-ship builders. Their co-operation in this direction would be invaluable.

A portion of the chain gearing of Rumsey's original steam-boat, which was used on the Potomac River in 1787, is in the collection.

Efforts are being made, with promise of success, to obtain drawings, etc., of many of Ericsson's inventions.

In the museum of the Stevens Institute, Hoboken, N. J., may be seen the original machinery of the propeller steam-boat, invented and constructed by Col. John Stevens, and navigated by him in 1803 and 1804.

A drawing of this machinery has been obtained, and a sketch of what is left of the original propeller, which is also at Stevens Institute, and which is a most valuable relic, is promised for our collection. I am in hopes of having a duplicate made at some future time.

A sketch of Fulton's *Clermont*, 1807, and a drawing of the machinery of this historic boat will shortly be placed on exhibition.

Plan of Fulton's original ferry system, steam-boat with single paddle wheel in center, and floating bridge, and slip at dock, 1812, has also been obtained. This is a fac-simile, on a reduced scale, of the original drawing made by Robert Fulton.

Through the kindness of Mr. Francis B. Stevens, grandson of Colonel Stevens, of Hoboken, N. J., and nephew of Robert L. Stevens, who built and navigated the steam-boat *Phœnix*, launched in 1807 (two weeks after Fulton's *Clermont*), a photograph from an oil-painting of this historic boat, the first steam-boat to navigate the ocean (from Sandy Hook to Cape May), has been obtained.

Mr. Isaac Dripps has had constructed a model one-eighth of full size, in brass, of what he claims to be the first screw-propeller ever placed in the stern of a steam-boat, before the rudder, on this side of the Atlantic, and has presented it to the Museum. The original propeller-wheel was constructed by Mr. Dripps in 1837, and was by him attached to the steam-boat *New Jersey*, which, by the way, was the first iron steam-boat to cross the Atlantic. It was the use of this propeller that caused the differences between Captain Ericsson and the Stevens brothers, resulting in the legal establishment of the fact that their father navigated the propeller steam-boat alluded to above on the Hudson in 1803–'04.

One of the iron plates from the hull of the *New Jersey*, collected by Colonel Bucklew, is also a part of the Museum collection.

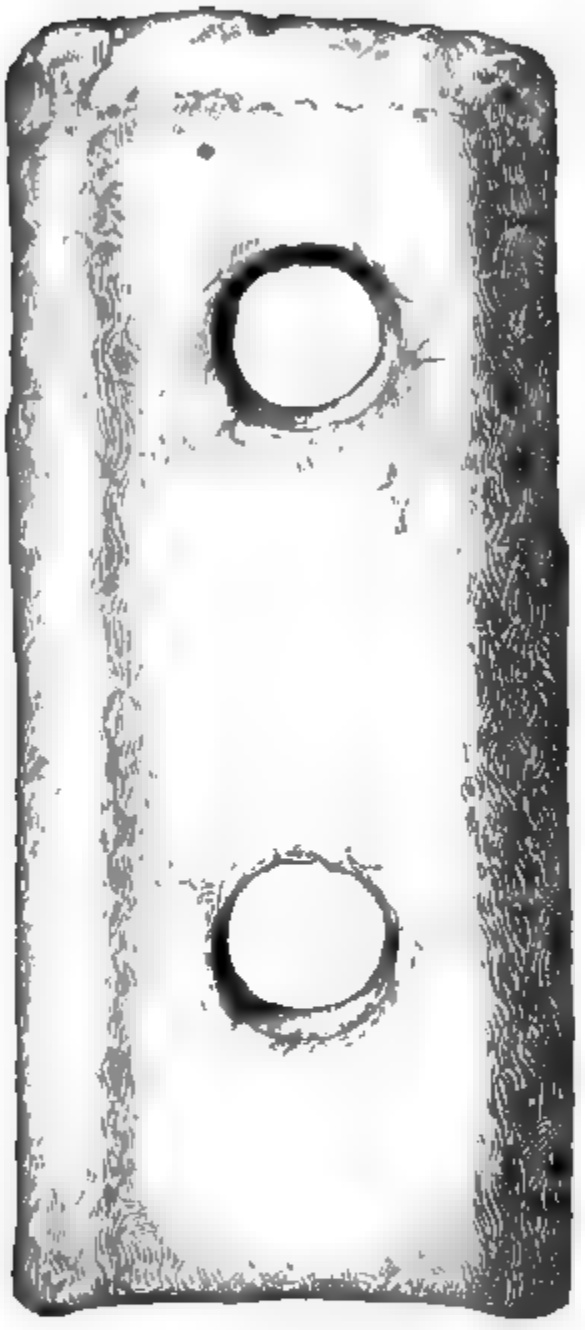


Fig. 1.

Fig. 2.

Fig. 3

DETAILS OF TRACK, CAMDEN AND AMBOY RAILROAD, 1831.

FIG. 1. **Iron tongue** to hold rails together at joints; one tongue only used at each joint.
FIG. 2. **Iron rivets** (put on hot) to join tongue to stem of I-rail—two rivets used at each joint.
FIG. 3. "**Hook-headed spike**," so called because the head only extended beyond one side. It was designed to fasten the base of the rail to the stone block without a chair.

On the 17th day of June, 1885, I attended the annual convention of the Association of American Master Mechanics, at Willard's Hall, Washington, D. C. After the privileges of the floor had been granted me to explain the purposes for which the section had been established, the following resolution was adopted, and the following correspondence ensued:

RESOLUTION PASSED BY THE AMERICAN MASTER MECHANICS' ASSOCIATION, IN ANNUAL CONVENTION ASSEMBLED, AT WASHINGTON, D. C., JUNE 17, 1885.

Resolved, That the American Railway Master Mechanics' Association has learned with great pleasure of the establishment by the Directory of the National Museum of the department of steam transportation (both railway and steam-boat), for the purpose of collecting and preserving materials which will illustrate the railway history and its development in this country. This association hereby heartily indorses the action referred to, and recommends that the members, as far as they can, assist Mr. Watkins, the curator in charge, in making such collections as will fulfill the purpose for which the department has been established.

* * * * * * *

REPLY FROM PROFESSOR BAIRD.

UNITED STATES NATIONAL MUSEUM,
Washington, D. C., June 25, 1885.

DEAR SIR: Mr. J. E. Watkins informs us that at the recent convention of the Society of Master Mechanics he was afforded by the officers of the society special facilities for the purpose of explaining the plan of the National Museum for the development of the collection illustrating the history of American railways. I desire through you to extend the thanks of the Museum to the society for the facilities afforded Mr. Watkins, and for the interest which was manifested in his work. I hope that through the co-operation of the society Mr. Watkins may be enabled to do very much towards developing this department, in which he and all of us are so greatly interested.

I have the honor to be, yours, very respectfully,

SPENCER F. BAIRD,
Secretary Smithsonian Institution and Director U. S. National Museum.

J. H. SETCHEL, Esq.,
Secretary American Railway Master Mechanics' Association.

The following circular letter was distributed among the members of the American Society of Civil Engineers, at their annual convention at Deer Park, Md., June, 1885. They, too, allowed me to occupy the floor, and after addressing them upon the subject much interest was manifested by the members, and much individual aid was promised.

UNITED STATES NATIONAL MUSEUM,
UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION,
Washington, June 20, 1885.

Mr. ——— ———,
Member American Society of Civil Engineers:

MY DEAR SIR: I beg leave to call your attention to the following letter:

"To whom it may concern: Mr. J. E. Watkins, of Camden, N. J., has been appointed Honorary Curator of the Section of Steam Transportation (Railways and Steam-boats) in the U. S. National Museum.

"Mr. Watkins is authorized to treat in the interests of the National Museum with any persons who may be willing to aid in the development of this section, and to add

to the collection already in the Museum objects illustrative of the history and growth of this industry in the United States. Specimens thus acquired will be exhibited in the Museum in the name of the donor.

"SPENCER F. BAIRD,
"*Secretary Smithsonian Institution and Director U. S. National Museum.*"

In order that the collection in connection with this section may be made as complete and creditable as possible your co-operation is earnestly requested.

The Pennsylvania Railroad Company has already presented to the Museum locomotive No. 1 (of the Camden and Amboy Railroad Company), more familiarly known as the "John Bull," together with a section of the original track, laid with stone blocks, etc., upon which this, the oldest engine on their system, ran. Many other valuable relics from other railroads have also been furnished.

I shall be glad to receive information as to the whereabouts of parts of such locomotives, cars, steam-boats, track, etc., as may be of historic value, together with authentic drawings of early railway appliances, also old tickets, old time-tables, systems of old baggage checks, etc.

A nation which contains within its borders over 120,000 miles of railway, representing a stock and bonded capital of over $7,000,000,000, should be zealous to preserve the history of the efforts of the pioneers in railway construction and equipment, which, during the last half century, have had such an immense influence upon our growth and the development of our civilization.

With this end in view the authorities of the National Museum have organized this section, by which they hope to perpetuate the history of the birth and development of the American railway and steam-boat, as well as to add an interesting and instructive feature to the Museum, which is annually visited by between two hundred and three hundred thousand persons, hailing from every State and Territory in the Union, as well as from almost every nation.

Yours, respectfully,

J. ELFRETH WATKINS,
Honorary Curator Section Steam Transportation.

On the 16th of January, 1886, I sailed from New York for a visit to the museums of the Old World in the interests of the section of steam transportation, and to investigate for the Pennsylvania Railroad Company the subject of electric lighting of railway cars and stations, and to examine the various systems of handling freight at large terminal stations abroad.

Through credentials furnished by the Secretary of the Smithsonian Institution and letters from officials of the Pennsylvania Railroad Company, unusual facilities were afforded me by the officials of railways and museums to make good use of fifty days on foreign soil.

Most tourists go abroad during the summer months and do Europe while everything is at its best. From the 29th of January, when we landed at Antwerp, until March 20, when we sailed from the same port, we had abundant opportunity to judge of the relative merits of foreign railways and American railroads so far as safety, speed, and comfort are concerned, in unpleasant winter weather. The ground covered was as follows:

New York to Antwerp (Belgium), to Harwich (England), to London, Edinburgh, Glasgow, Port Glasgow, Greenock, Belfast (Ireland), Giant's Causeway, Londonderry, Strabane, Dublin, Galway, Limerick, Cork, Dublin, Holyhead (England), Chester, Liverpool, Crewe, Man-

THE WEBB SYSTEM OF PERMANENT-WAY WROUGHT-STEEL CROSS-TIES AND CHAIRS. BULL-HEADED RAIL WEIGHING 80 POUNDS PER YARD

chester, Wolverton, London, Southampton, Havre (France), Modane, Mont Cenis tunnel, Milan (Italy), Venice, back to Milan, and through the St. Gothard tunnel to Basle, Strasburg, Brussels, Cologne, Antwerp, and New York—over 11,000 miles.

The great city of London, 33 miles long and 22 wide, with the scores of railway stations, its miles of underground rapid-transit roads, and immense freight terminals, furnishes perhaps the most diversified field of investigation in the universe to the engineer or railroad historian.

The management ot the signal box "A," at Waterloo station, London and South Western Railway, under which more trains pass per day than under any other box in the world, was most interesting. Notwithstanding the fact that a dense fog, such as one only sees in London, was prevailing at the time, the traffic inbound, which is very heavy about 9 a. m., was handled with comparative dispatch and perfect safety by the interlocking-switch system. While I was in the box it was visited by a government inspector, appointed by the board of trade, who examined the details of the working of the levers, and expressed satisfaction that some changes in the mechanism which he had suggested at a previous visit had been so promptly made.

This surveillance by government officials is said to have been attended by most beneficial results.

As the extreme length of the British Isle is about 550 miles, what we call here a long run is unknown there. The journey from London (Euston Station) to Edinburgh, via the London, Northwestern and Caledonian Railways, 401 miles, via the 10 a. m. express, February 13, 1886, was made in a little less than ten hours, 541 minutes actual running time, at an average speed while running of 44½ miles per hour.

The journey was made in a compartment with lavatory, in a carriage which contained every convenience, for which a first-class fare of £3 4*s.* 0*d.* was charged. This is a journey similar to that from Jersey City to Pittsburgh, 444 miles, which is run by Pennsylvania Railroad limited express in 11 hours, with much better accommodations; price of ticket, including Pullman car, $13.

Although luncheon baskets are generally to be had by telegraphing ahead on long journeys, it was not necessary in this case, since over thirty minutes was consumed shunting carriages and transferring luggage at the dining station.

The city of Crewe bears the same relation to England that Altoona does to the State of Pennsylvania, both being the mechanical headquarters of the most prominent railway in the region. Some idea of the magnitude of the work carried on there may be gleamed from the fact that I saw under one roof £150,000 ($750,000) worth of locomotives that had never turned a wheel.

Mr. Webb, the locomotive superintendent of the London and Northwestern Railway, who is in charge at Crewe, explained to me that they found it cheaper to get their stock of one class of work up in a large

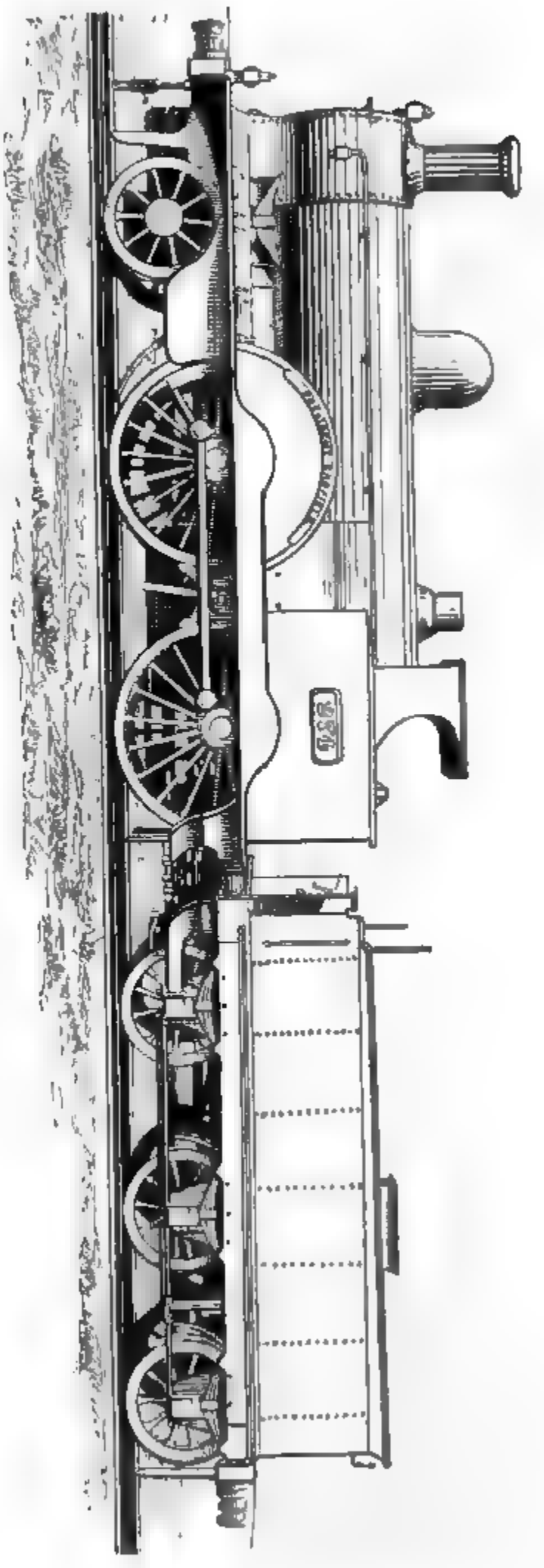
quantity at a time, and that the difference in cost more than made up for the difference in the interest on the amount invested. The London and Northwestern Railway Company have their rail mill here, and manufacture spikes, chairs, and the steel cross-tie (of which a sample has been sent us for the Museum collection, see Pl. III) in large quantities.

Since my return Mr. Webb has written me that the Pennsylvania Railroad Company had ordered a mile of London and Northwestern standard iron track, consisting of 80-pound bull-headed rail, wrought-steel cross-tie, with chair, complete, for experimental purposes. It is expected that this mile of track will be laid where the traffic is exceptionally heavy, and a comparison of its durability made with the American system.

The passenger carriage shop of the London and Northwestern Railway, at Wolverton, is a most interesting place for an American to visit.

While the English locomotive, of which we have shown a cut in Pl. IV, is somewhat different from the American in appearance, the difference is not so marked as in the passenger cars or "carriages," as they call them. (Pl. V.) We were particularly fortunate in our brief stay in Wolverton in being able to visit the private carriage of the Duke of Sutherland, and to inspect the royal train of five carriages, which was being put in order for Queen Victoria's annual spring journey to Scotland. The carriage which was constructed expressly for Her Majesty's private use, with its gilded furniture and pale blue satin upholstery, is planned in marked contrast to what we are accustomed to find in American special cars. But as the longest journey there is generally made in daylight, there is no necessity for extensive sleeping compartments, and the luncheon supplied at nearly every station takes the place of the dinner which we get on our dining cars. The wheels of the carriages of the royal train conformed to the standard of the London and Northwestern Railway, being composed of twelve segments of wood (teak), around which a steel tire is shrunk, a steel hub being used. A sample of these wheels, and a number of drawings showing the construction of the three classes of day cars, and the sleepers in use on this road have been promised me.

A great deal of attention has been given for several years to the subject of electric lighting of passenger carriages upon the English roads. Two examples give a general idea of the successful experiments made. Between Liverpool and Manchester a fast train is equipped with the incandescent lamps, one in each compartment (and one additional for emergency), the electricity being furnished by a dynamo on the tender driven by steam from the locomotive—no storage battery being used. I was informed that little trouble had been experienced in the management of these lights, which had been in continuous use for many months, the cost being low, the quality of the light considered.



LOCOMOTIVE NO. 274, "PRESIDENT GARFIELD," LONDON AND NORTHWESTERN RAILWAY OF ENGLAND, 1885.

On the London, Brighton and South Coast Railway a very ingenious contrivance had been put on several trains. A dynamo in the guard's van, which is always attached to one end of the train, was driven by a belt from the axle of one of the wheels. The overplus of the electricity generated while the train is running being stored in secondary batteries for use while the train is standing. This had proved a very satisfactory system, and a company of wealthy capitalists had been formed to introduce this invention on a number of the other roads, with great promise of success. All of the steam-ship packet lines, crossing from Ireland and France to England, had put the electric light upon their best boats, and the Brush light is almost universally used upon the wharves and by best roads at passenger and freight stations, and in yards and other public places, notwithstanding that the price of gas is a little more than half what it is in this country.

A drawing showing the arrangement of dynamo gearing, lamps, etc., on the London, Brighton and South Coast Railway—where, by the way, I saw the only Pullman cars abroad, and they were brilliantly lighted by electricity—has been secured for the Museum.

Upon a stone block at Darlington stands engine No. 1 of the Stockton and Darlington Railway, built by Stephenson and placed in service in 1825; the first locomotive in the world to be in continuous general service upon a railway constructed for passenger and freight traffic.

A journey of 18 miles from Glasgow along the shores of the Clyde brought me to Greenock. On the second floor of a stone house badly out of repair, at the foot of William street, I stood, on the 19th of February, 1886, in the room where James Watt was born, exactly one hundred and fifty years and one month before, and a fussy old lady, who appeared to be a self-appointed mistress of ceremonies, accepted a sixpence with a courtesy for unlocking the doors, while the old vandal who accompanied her pocketed a shilling, and cheerfully knocked a brick out of the historic fire-place where he declared young James first watched the steam rise from his mother's kettle and wondered at its force, and this legend was corroborated by others.

At Glasgow I enjoyed a trip down the Clyde and my visits to Napier's and Reid's ship-yards were full of interest.

All of the principal large vessels under contract were to have the new triple expansion engine.

After a night journey from London to Southampton via the London and Southwestern Railway and a most unpleasant voyage across the channel we landed at Havre, France. The journey from Havre to Paris was full of interest.

I was not favorably impressed with either the plan of construction nor the condition of the French railways. The running time was slow, the signals clumsy, and the train-men had the appearance of being poorly paid and unhappy.

The plans of the early English engineers and railway constructors seem

to have been pretty generally followed. The people of Paris are dependent upon steam appliances for their means of transit from one part of the city to another; the small steamers that run up and down the Seine, touching at the foot of each prominent street every few minutes, being patronized much the same as the 'buses of London, or the tram cars in our American cities.

Many freight barges are towed up this river, in which the current is very swift, in a novel manner; a chain with large links and several miles long, lies on the bed of the stream; an odd-shaped boat with a powerful engine drives a wheel above deck, which gears into the links of this chain, thus hauling the tow of barges against the stream, and providing for the emergency of floating away in case the engine should be disabled. Large quantities of wine from the outlying districts through France are transported to the city in this manner.

Leaving Lyon station, Paris, at 9 p. m., in a *wagon lit*, we reached the north end of the Mont Cenis Tunnel about 11 the next morning. Eight and a half miles of darkness were traversed in thirty-two minutes, and we had passed through what was ten years ago the longest tunnel in the world and is now the second in length.

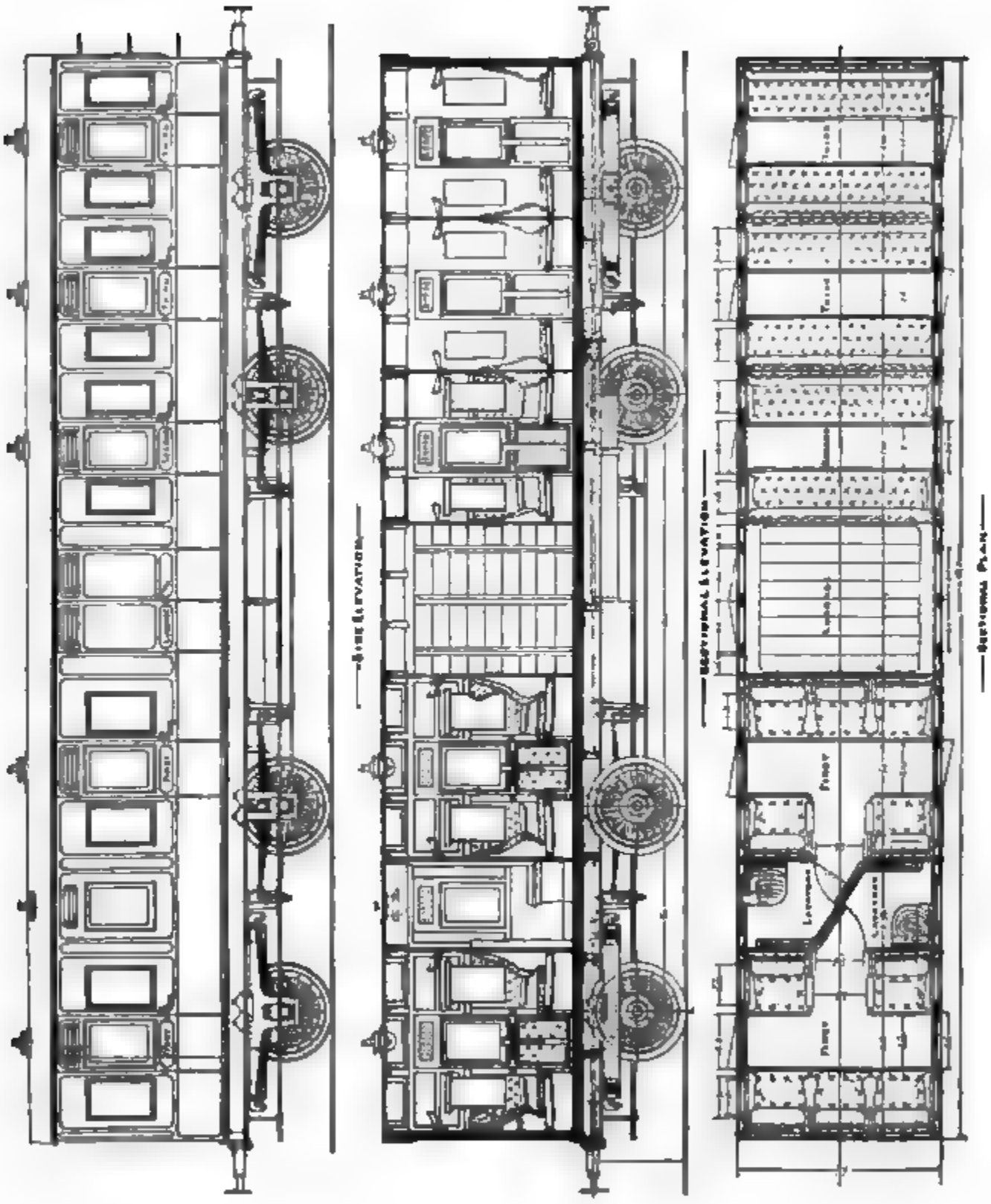
At Turin, we were transferred to a carriage (with the backs of alternate seats facing each other) somewhat resembling American cars, except the aisle was not in the center. Seats for three persons were on one side of the aisle, and for one only on the other.

The Italian train-men and station agents perhaps receive less pay than in any portion of Europe. Women act in latter capacity at many of the smaller stations, as in France. The time made is very slow while running and long stops are made at every station. The four-wheel cars are poorly painted, and, except on fast express trains from Paris to Rome, Naples, etc., they rode very rough.

The whistle of the steam-boat bids fair to drown the song of the gondolier in Venice, as small steam-boats with shrill piping whistles run up and down the Grand Canal at regular intervals, furnishing the Venetians who are denied the pleasure of riding in a tram car, another means of rapid transit. Numbers of small steam barges may be seen on the water-ways through Venice and on the bay carrying passengers to and from Lido and other points.

Returning from Venice to Milan and journeying thence northward, we reached the St. Gothard Railway at Chiasso, the first station in Switzerland over the Italian border, and during the journey of 232 kilometers (143.7 miles), consuming eight hours, we were scarcely a moment out of sight of an engineering feat that would have excited the wonder of the world a half century ago.

In the limits of these 144 miles there are thirty-four tunnels, aggregating many miles in length. I had thought that, with the somewhat intimate knowledge of railroads in the mountain and mining districts of Pennsylvania, I was familiar with heavy curves and steep grades,



RAILWAY PASSENGER CARRIAGE FOR FIRST, SECOND, AND THIRD CLASS PASSENGERS, AND COMPARTMENT FOR LUGGAGE. LONDON AND NORTHWESTERN RAILWAY OF ENGLAND, 1885.

This car has eight wheels. The forward and rear wheels have radial axles instead of being placed in a truck (or bogie) as in the American car. The other wheels are rigid.

but there is no comparison. The great tunnel is reached a few moments after passing the station at Airolo, and for twenty-two and one-half minutes of utter darkness we are passing through a little more than 9¼ miles—the longest tunnel in the world, and it is with a feeling of relief that one sees daylight at Goeschenen at the northern end. I was fortunate enough to obtain for our section a good photograph of each of the entrances to this great tunnel, and what appears to be a very accurate map, scale 1 to 100,000, showing the location of all the tunnels on the road, and giving a fair idea of the contour of the country.

At Lucerne the St. Gothard Railway terminates, but the carriages run through to Basle without change.

The railway from Basle to Strasburg is the best equipped road I saw on the Continent, the second-class compartment in the carriages, constructed on the English plan, being upholstered in a bright durable color, and as comfortable as many first-class carriages in England; quite a relief after many days of somber blue-black on the other roads. On this railway the track and road-bed are well taken care of, and fast time is made.

The German locomotives appeared to be more clumsy or old fashioned any than we had seen, but their performance seemed very satisfactory.

The Belgian railways are well built and equipped; fast time is made and the travel appears heavier than elsewhere on the Continent. The locomotives on the road from Brussels to Antwerp seemed better calculated for the work than on the German roads. Shorter time was spent at stations everywhere in Belgium and more dispatch given to arriving and departing trains than elsewhere.

At various points on the Continent experiments are being made with glass, iron, and steel cross-ties for railways of heavy traffic, and I doubt if the tourist a few years hence will travel many miles over wooden sleepers.

EUROPEAN RAILWAY MUSEUMS.

South Kensington Museum.—To the student of the history of steam and steam transportation the South Kensington (Patent) Museum contains the most valuable and instructive collection of objects abroad.

The Englishman of to-day, justly proud of the inventive genius of the last generation, is zealous to perpetuate the history of the results of the life work of Newcomen, Savery, Smeaton, Watt, Murdoch, Trevithick, George and Robert Stephenson, and Symington.

In our own country, however, with the exception of Fulton, no American inventor of steam appliances has received the meed of praise due him, and yet no nation in the world owes so much to locomotive and steam-ship inventors and railway constructors as our own.

Owing to the limited area of Great Britain, however, which, exclusive of Ireland, is a trifle less than the States of Pennsylvania and Ohio, the

record of invention has been easily kept before the popular eye. In this old country, advanced in civilization and blessed with wealth, scientific societies and technical journals have kept the results of the labors of master minds constantly before the intelligent public, and the success of the lucky inventor has speedily brought him fame and fortune. Outside the circle of military and naval heroes no names are dearer to the British heart than Watt and the Stephensons (George and Robert), and now that a memorial window to poor Trevithick is to be placed in Westminster this illustrious trio will become a quartette, much to the gratification of the impartial student of the history of the early locomotive who does not permit the glamour of success to blind his vision to true merit.

Original stationary engines built under the personal supervision of James Watt are in this collection, together with many of the models which he and his foreman (Murdoch) made to illustrate the patents which he obtained from the English Government.

Original drawings made by Trevithick from which his high-pressure stationary and locomotive engines were constructed as early as 1802 are framed and hanging on the walls, while several of his earliest boilers are to be found upon the museum floor.

A large portion of the machinery of the steam-boat *Comet*, the first English steam-boat commercially successful (built in 1812), which is as much reverenced in Great Britain as is Fulton's *Clermont* in America, is also carefully preserved.

Upon presenting my credentials to Sir Phillip Cunliffe Owen, the director of the South Kensington Museum, I was most courteously received, and as he was fully occupied (February, 1886) in organizing the plans for the Colonial Exhibition, I was referred to R. Thompson, esq., the assistant director, who showed me every attention, and led me at once to the "Rocket," which he said every American railroad man wanted to see. I must confess to a feeling of awe when I placed my hand on the pony of 1829, which has been gradually bred up in size and strength to the powerful iron horse in a half century; nor could I help a feeling of regret that the time was not ripe for the development of the Trevithick breed, which made fair speed and did fair service a quarter of a century before Stephenson's successful racer. Next to the "Rocket" stood the "Sanspareil," the victor and the vanquished in the great Rain hill contest of 1829, which stimulated faith in the steam locomotive that had been creeping slowly along for twenty-five years before, giving it vigor and strength to begin a new life of the greatest usefulness. The scope of this report will not permit of an extended list of the interesting and instructive relics, drawings, and models which make this the Mecca of all historians of the stationary and locomotive steam-engine.

Hunterian Museum at the University of Glasgow.—The [illegible] model.—Nearly every one interested in [illegible]

that in the winter of 1763 and 1764 James Watt, who was then twenty-seven years old, and was a mathematical instrument maker and general mechanician for this University, became interested in steam through a toy model of Newcomen's engine, which had been placed in his hands for repairs. This period is described by an eminent writer as "the era of all other the most eventful in the history of the steam-engine."*

This model is still preserved in the Hunterian Museum, connected with the University, and the knowledge of the fact that I have held it in my hands and moved the valves that Watt repaired will always be held as the most precious remembrance of my tour abroad.

It is rather a curious coincidence that the walls of the same institution that witnessed Watt's successful experiments with steam a century and a quarter ago should now contain the work-shop and laboratory of one of the most distinguished electricians of the age, who has labored so successfully in investigating and utilizing the new power which bids fair to supersede the inventions which immortalized that great inventor.

WATT'S MONUMENT.

A few feet from the Newcomen model stands a white marble statue of the great inventor in a sitting posture, sculptured by Chantrey in 1825. The inscription on the pedestal reads—

This Statue of

JAMES WATT,

Fellow of the Royal Societies
of London and Edinburgh,
and Member of the Institute of France,
is presented by his son
to the University of Glasgow
in gratitude for the encouragement
afforded by its Professors
to the Scientific pursuits
of his father's early life.

In Greenock, Scotland, is a small museum which contains a number of letters written by Watt in regard to his inventions, a few models and relics, besides a statue by Chantrey, similar to the one at the Hunterian Museum at Glasgow, and a library containing a number of valuable books.

The curator has kindly promised to send the National Museum a small map of the town, showing the location of Watt's birthplace and a photograph of the house in which he first saw the light.

Kelvin Grove M Grove Museum, [illegible] most interesting [illegible] hulls of the [illegible] boats: the *Fai* the *Com*

English steam-boat), 1812; and the *Charlotte Dundas* (first successful experimental boat), 1802.

Standing on a pedestal is a cylinder from the first engine put in the *Comet*. Mr. Miller, secretary of the Scottish Institute of Engineers and Ship-builders, tells me that this was taken out and replaced by another cylinder, and after having been used for some time by an old lady for a chimney top, was presented by her to the Museum as soon as she learned of its historic value. Upon the pedestal is placed a "Record of Steam Navigation in the Clyde" and upon the walls hang several photographs of the machinery of the *Comet*, with the inventor, Henry Bell, standing beside it. Mr. James Paton, Superintendent of the Museum, presented me with fac-similes of promissory notes given by Henry Bell to David Napier, 1812, in payment for the boiler of the *Comet*, the first steamer that carried passengers in Europe.

Also, a fac-simile of certificate from Admiral Sir Richard Bickerton, of His Majesty's navy, and the captains of His Majesty's ships *Dragon* and *Superb*, dated July 4, 1802, in regard to Mr. Shorter's propeller, by the use of which one ship in a calm "hove away at the rate of 1 & a ½ miles per hour, having 8 hands at the capstan."

The original documents are the property of Napier Brothers, ship-builders on the Clyde, and are loaned by them to the Kelvin Grove Museum, Glasgow, for exhibition. A model of a propeller worked in this manner is also shown.

Paris and its Museums.—There are three thoughts connected with Paris that are of great interest to the student of the story of steam.

(1) In one section of the Conservatoire des Artes et Metiers stands a marble statue of Papin, to whose investigations I believe the invention of the steam piston and cylinder is largely due—holding a steam cylinder over a flame; the apparatus having been modeled from the drawings of the one originally constructed by him.

(2) Near by it stands Cugnot's steam road locomotive of 1770, the oldest steam-locomotive in the world.

(3) The historical spot on the banks of the Seine, which I visited, and where Fulton made his experiments, 1801, 1802, and 1803, with steam appliances, both for towing boats and for submarine work against the wooden British sailing ships that were operating against Napoleon in these eventful years. In 1803 or 1804 Napoleon had become much interested in Fulton's experiments with steam. They had an interview, and Fulton's inventions were referred to the French minister of the marine for investigation. The English naval authorities, hearing of this, became greatly alarmed, for Napoleon, who then had a large force of men massed at Bologne, had it so arranged that if he could get the special barges which he had built for the purpose six hours ahead of the British in their journey across the channel he could march his army to London without serious opposition. But thus early in the history of steam navigation the value of the marine engine of the future was appreciated by

the nation which was destined afterwards to have the greatest steam navy in the world, and a handsome fee was paid Fulton to return to England, where he had alterations and additions made by Bolton and Watt, at Soho, to one of their own engines, which was exported to America and placed afterwards in the *Clermont*, the lucky boat which gave Fulton fame and fortune. Thus we find that this celebrated inventor, who designed what lives in history as the first successful steamboat in the world, pursued his investigations in France, completed his engine in England, and won his laurels in America.

There is little else in the French museums, either in the Conservatoire or the naval section of the Louvre, of interest to the section of steam transportation.

Naval Museum, Venice.—This museum is full of the most interesting models and relics, some of them of great age, but I could find nothing to even suggest that the subjects of the Queen of the Sea had any ideas in regard to paddle-wheel or propeller navigation by steam or otherwise prior to this century. In Rome is to be seen a marine painting several centuries old representing oxen walking around a circle on the deck of a vessel driving a windlass geared to a paddle-wheel in the stern of the boat—a somewhat similar arrangement to the stern-wheel boats used for shoal navigation on the Ohio and Mississippi Rivers. In another painting two or three centuries old a sea-nymph sits floating in a shell, with a paddle-wheel apparently revolving on one side. It would seem, however, that the gilded floating palace, in which the Doges performed the ceremony of wedding the sea each year, and which was driven by the galley slave chained to his oar, was the most advanced stage of marine architecture to which the Venetians—once rulers of the sea—attained, until after the introduction of steam.

PETITION TO CONGRESS.

A description of the section, which was published in the Washington Star, January 16, 1886, having been widely circulated during my absence abroad, I found upon my return that over thirteen hundred gentlemen connected with railroads in all sections of the United States had petitioned Congress for an appropriation to establish a section in the National Museum devoted to the history of the railroad and steamboat. Neither at this session, nor during the next, was this request complied with, and I have been compelled to do what little has been done since my return, with my private means, during brief periods of intermission from railway duties; short leaves of absence having been granted through the kindness of the general manager of the Pennsylvania Railroad Company, in whose service I have been employed for nearly fifteen years consecutively.

A copy of the petition to Congress, with the names of the more prom-

inent of the signers, together with the resolutions passed by the Franklin Institute of Philadelphia, is to be found below:

To the Congress of the United States:

The undersigned, desirous of perpetuating the history of the birth and development of steam transportation (by steam-boat and railway) in America, respectfully petition your honorable body to appropriate such a sum of money as may be deemed necessary to carry out the plans recently adopted for the organization of the Section of Steam Transportation in the U. S. National Museum; said sum to be expended under supervision of Prof. Spencer F. Baird, Secretary of the Smithsonian Institution and Director of the U. S. National Museum.

Alabama Great Southern Railroad:
Charles Schiff, vice-president.
Allegheny Valley Railroad:
David McCargo, general supt.
T. R. Robinson, treasurer.
E. H. Utley, G. F. and P. agent.
Atlantic and Pacific Railroad:
H. C. Nutt, president.
H. W. Gardiner, secretary.
D. L. Gallup, auditor.
Atlantic and West Point and Western Alabama Railroad:
L. P. Grant, president.
Cecil Gabbett, general manager.
N. M. Abbett, secretary and treasurer.
Atchison, Topeka and Santa Fé Railroad:
P. F. Barr, superintendent.
Charles Wincheck, general foreman.
Edward Flockett, master mechanic.
R. H. Emerson, master mechanic.
H. V. Farries, master mechanic.
Baltimore and Delaware Bay Railroad:
J. F. Bingham, president.
Fred Gerker, general manager.
Baltimore and Ohio Railroad:
Robert Garrett, president.
F. H. Britton, superintendent.
B. F. Luther, master mechanic.
E. T. Affleck, division freight agent.
Buffalo, New York and Philadelphia:
G. Clinton Gardiner, president.
C. H. Allen, vice-president.
G. S. Gatchell, gen. supt.
John Dougherty, treasurer.
R. D. McCreary, engineer.
Boston, Hoosac Tunnel and Western:
A. Kountze, president.
Buffalo, Rochester and Pittsburgh:
Walston H. Brown, president.
William E. Hayt, chief engineer.
George E. Merchant, gen. maugr.
I. S. Emery, general freight agent.
Boston and Providence Railroad:
Henry A. Whitney, president.
A. A. Folsom, superintendent.
Bangor and Portland Railroad:
C. Miller, president.
George W. Mackey, secretary.
E. G. Wire, chief engineer.
Charles N. Miller, G. F. and P. A.
Boston and Bangor Steam-ship Co.:
W. H. Hill, jr., general manager.
Burlington, Cedar Rapids and Northern Railroad:
C. J. Ives, president.
Robert Williams, superintendent.
S. S. Dorwart, secretary.
H. F. White, chief engineer.
Cape Fear and Yadkin Valley Railroad:
Julius A. Gray, president.
Chicago, Burlington and Northern R. R:
Charles C. Upham, chief engineer.
J. M. Forbes, treasurer.
Cleveland and Canton Railroad:
J. W. Wardwell, gen. supt.
Albert Rokusek, G. F. and P. A.
Cincinnati and Eastern Railroad:
B. F. Coats, P. and R.
H. E. Sawyer, S. T.
T. D. Rhodes, T. and G. P. A.
W. L. King, chief engineer.
J. C. Horner, Supt. M. P.
Chicago and Alton Railroad:
J. H. Parsons, superintendent.
C. A. Smith, supt. water-works.
J. H. Finney, asst. superintendent.
Jacob Johann, master mechanic.
C. H. Mead, foreman car-shops.
G. D. Brooke, general foreman.
Chicago, Burlington and Quincy R. R.:
Henry B. Stone, general manager.
J. O. Bosler, general superintendent.
George C. Smith, chief engineer.
F. C. Rice, superintendent.
C. N. Rosseguin, superintendent.
F. E. Walker, engineer.
F. J. Allen, engineer.
R. J. McClure, construction engineer.
Thomas Gordon, division engineer.
J. O. Thorne, brg. and bldg. supt.

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Wm. Irving, gen'l purchasing agent.
R. W. Colville, master mechanic.
Cleveland, Akron and Columbus Ry.:
J. Monserrat, president.
R. French, chief engineer.
R. G. Sharpe, supt. transportation.
E. C. Jones, G., F., and P. agent.
Chicago and Eastern Illinois Railroad:
D. R. Patterson, purchasing agent.
O. S. Lyford.
Chicago, Burlington and Northern R. R.:
George B. Harris, general manager.
C. C. Upham, chief engineer.
A. B. Hinckley, auditor.
Columbus and Cincinnati Midland R. R.:
S. P. Peabody, gen'l superintendent.
Cleveland, Columbus, Cincinnati and Indianapolis Railway:
N. H. Devereux, president.
Chicago, Milwaukee and St. Paul R. R.:
D. J. Witemore, chief engineer.
J. W. Lowry, gen'l master mechanic.
E. Fairbairn, master mechanic.
A. E. Alcott, general foreman.
C. King, general foreman.
Central Iowa Railroad:
William Hanna, director.
D. V. Phelps, ass't superintendent.
Cincinnati and Muskingum Valley R. R.:
F. G. Darlington, superintendent.
Cincinnati Southern Railway:
John Carlisle, trustee.
Chicago and Northwestern Railway:
J. E. Blunt, chief engineer.
Cincinnati, Hamilton and Dayton R. R.:
C. C. Waite, vice-president.
J. Ramsey, chief engineer.
Chicago, Rock Island and Pacific Ry.:
A. Kimball, vice-president.
C. L. Ewing, claim agent.
W. H. Robinson.
George F. Walker, superintendent.
Cincinnati, Wabash and Michigan R. R.:
Norman Berkley, general manager.
O. W. Lamport, superintendent.
S. B. Ginker, master mechanic.
Cincinnati, Indianapolis, St. Louis and Chicago Railway:
M. E. Ingall, president.
Cleveland and Pittsburgh Railroad:
John Thomas, superintendent.
R. S. Smith, assistant manager.
G. A. Ingersoll, sec'y and treasurer.
Cincinnati, New Orleans and Texas Pacific Railway:
Frank S. Boud, president.
R. Carroll, general superintendent.
G. B. Nicholson, chief engineer.
G. Bouscaren, construction engineer.
James Meehan, supt. M. P. and M.
Columbus, Hocking Valley and Toledo Railway:
M. M. Green, president.
Wm. Greene, second vice-president.
William N. Cott, treasurer.
W. H. Jennings, engineer.
F. B. Sheldon, engineer.
J. G. Hutchins, master mechanic.
William A. Miles, general freight ag't.
Chicago and West Michigan Railroad:
J. K. V. Agnew, gen'l superintendent.
J. H. Carpenter, G. F. and P. A.
Delaware, Lackawana and Western R. R.:
Samuel Sloan, president.
Dayton and Ireton Railroad:
James M. Prendergast, president.
Delaware and Bound Brook Railroad:
J. H. Stevenson, secretary and treas.
Detroit, Grand Haven and Milwaukee Ry. and Chicago and Grand Trunk Ry.:
W. J. Spicer, general manager.
J. W. Fortune, ass. gen'l manager.
Geo. Masson, chief of engineers.
A. B. Atwater, superintendent.
W. J. Morgan, superintendent.
J. H. Minor, treasurer.
H. Roberts, mech. supt.
John Main, asst. G. F. agent.
J. E. Quick, gen'l baggage agent.
J. Loriner, gen'l storekeeper.
Duluth and Iron Range R. R.:
C. Tower, president.
L. P. Beck, secretary.
A. H. Viele, auditor.
R. H. Lee, chief engineer and supt.
John Mallman, chief explorer.
Detroit, Lansing and Northern R. R.:
J. B. Mulliken, general manager.
F. M. Fish, general superintendent.
J. J. McVone, chief engineer.
John Doyle, general road-master.
B. F. Calvin, general road-master.
G. C. Watrous, superintendent M. P.
W. A. Carpenter, G. F. and P. agent.
G. W. Light, assistant road-master.
R. Rustine, assistant road-master.
R. M. Tiffany, foreman car dept.
A. P. Sweet, master painter.
T. S. Newton, gen'l rg. agent.

East Tennessee, Virginia and Ga. R. R.:
J. C. Andrews, gen'l sth. agt.
F. R. Hunger, superintendent.
Elmira, Cortland and Northern R. R.:
A. A. McLeod, general manager.
East Tennessee and Western North Carolina R. R.:
A. Pardee, jr., president.
J. G. Wise, secretary and treasurer.
F't W., Cincinnati and Louisville R. R.:
W. W. Worthington, gen'l supt.
Charles Hoffman, auditor.
R. F. Kinnaird, G. F. agent.
Florida Southern Railway:
James D. Hallston, superintendent.
Sherman Conent, gen'l manager.
Flint and Pere Marquette R. R.:
H. C. Potter, V. P. and gen'l mangr.
Sanford Keeler, superintendent.
William B. Sears, chief engineer.
W. F. Potter, assistant supt.
G. M. Brown, general road-master.
H. M. Perry, M. C. builder.
Thomas J. Matswell, M. M.
Gulf, Colorado and Santa Fé Railway:
M. W. Joyce, general agent.
Thomas M. Jackson, land agent.
W. J. Sherman, engineer.
Henderson Bridge Company:
S. S. Eastwood, secretary.
Houston and Texas Central:
A. H. Swanson, general manager.
G. A. Quinlan, engr. and supt.
E. W. Cave, treasurer.
Hanover Junction and Gettysburg Railroad:
A. W. Eichelberger, president.
R. M. Wirt, secretary and treasurer.
Indianapolis, Decatur and Springfield Railroad:
H. B. Hammond, receiver.
G. W. Bender, superintendent.
Indianapolis and St. Louis Railway:
T. W. Burroughs, superintendent.
W. P. Orland, assistant M. M.
Illinois Central Railroad:
J. C. Clarke, president.
R. S. Charles, president.
C. M. Sheafe, superintendent.
J. G. Morey, general agent.
D. R. Morey, general freight agent.
Jno. M. Turner, division supt.
J. W. Colman, A. G. P. agent.
Wm. Murray, gen'l Sth. P. agent.
S. B. McConnico, general agent.
Kansas City, Fort Scott and Gulf R. R.:
G. H. Nettleton, general manager.
Norman Jones, general agent.
Lake Erie and Western Railroad:
C. H. Perry, chief engineer.
D. G. Hill, general superintendent.
W. S. Weed, general freight agent.
H. J. Casteter, auditor.
A. D. Thomas, cashier.
G. W. Smith, G. P. agent.
Lake Shore and Michigan Southern R. R.:
Maitland Porter, general supt.
P. F. Wright, general supt.
G. W. Steven, supt. M. P.
Geo. Gallaway, foreman car shops.
P. J. Clansy, foreman car shops.
J. S. Graham, master mechanic.
L. C. Robson, M. C. builder.
John Kirby, general M. C.
Norman Totten, L. and C. dept.
L. C. Higgins, purchasing agent.
Lehigh Valley Railroad:
E. B. Wilbur, president.
Charles Hartshorn, vice-president.
J. R. Fanshawe, secretary.
William Alderson, treasurer.
A. W. Stedman, chief engineer.
John Taylor, general manager.
J. H. Heckman, general freight agent.
E. B. Byington, gen. passenger agent.
Louisville and Nashville Railway:
A. M. Quarrier, second vice-president.
L. R. Knott, assistant to president.
R. Wells, assistant to president.
C. R. Barnhardt, supt. transportation.
C. W. Corringe, general agent.
F. B. Robson, road master.
G. W. Hinman, supt. brgs. and bldgs.
L. Howell, superintendent.
H. W. Bruce, attorney.
Theo. Welch, general freight agent.
J. C. Loomis, master trains.
James Geddes, superintendent.
C. O. Parker, superintendent.
J. T. Harrahan, general manager.
R. K. Warren, secretary.
Cushman Quarrier, comptroller.
W. W. Tompson, treasurer.
Lyttleton Cooke, attorney.
F. M. Fonda, assist. superintendent.
Louisville, New Orleans and Texas Ry.:
W. N. Marshall, master transp.
J. J. Casey, m. c. builder.
R. F. Reynolds, commercial agent.
E. D. Anderson, master mechanic.

Michigan Central Railroad:
Benj. Douglass, engineer bridges.
J. D. Hawks, chief engineer.
A. Torrey, assistant engineer.
I. P. Morris, assistant engineer.
W. B. Stillson, assistant engineer.
A. G. Dailey, superintendent transp.
Mexican National Railway:
C. A. Merriam, gen. superintendent.
E. A. Handy, engineer.
J. M. Winslow, master mechanic.
Minnesota and Northwestern Railroad:
J. C. Fernstorm, chief engineer.
Frank Skipwith, asst. chief engineer.
Chr. Nasten, assistant engineer.
W. J. Wilgus, assistant engineer.
Milwaukee and Northern Railroad:
James C. Spencer, vice-president.
C. F. Fulton, general superintendent.
Milwaukee, Lake Shore and Western Ry.:
J. Donahue, superintendent.
Missouri Pacific Railway:
H. M. Hoxie, vice-president.
Wm. Kerrigan, gen. superintendent.
D. Brocke, supt. transportation.
Maryland Steam-boat Company:
H. B. Ensign, president.
James E. Byrd, secretary.
Mexican Central Railway:
F. W. Johnston, sup't M. P. and M.
New York Central & Hudson River R. R.:
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Horace J. Hayden, vice-president.
J. M. Tancey, general superintendent.
Theodore Voorhees, ass't gen'l sup't.
C. M. Bissell, superintendent.
New York, New Haven & Hartford R. R.:
C. S. Davidson, superintendent.
Otis C. Lackey, master mechanic.
New York and New England R. R.:
Elliot Holbrook, superintendent.
L. W. Palmer, superintendent.
J. S. Henny, superintendent M. P.
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G. H. Spriggs, G. F. and P. A.
New York, Lake Erie and Western R. R.:
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New York, Pennsylvania and Ohio R. R.:
N. D. Woode, superintendent.
Aug. Mordecai, engineer.
Northern Central Railway:
Robert Neilson, gen'l superintendent.
A. C. Hippy, engineer M. W.
E. D. Nelson, superintendent M. P.
S. W. White, secretary.
New York, Philadelphia & Norfolk R. R.:
William A. Patton, vice-president.
William Cariss, secretary and auditor.
R. B. Cooke, G. B. agent.
H. D. Dunne, superintendent.
G. W. Russell, master mechanic.
Newport News & Mississippi Valley R. R.:
R. W. Briggs, sup't M. P. and M.
John Fitzgerald, master mechanic.
W. E. Ramsey, general foreman.
D. S. Weaver, general foreman.
New Orleans and Vicksburg Packet Co.:
J. Janney, general agent.
Norfolk and Western Railroad:
F. J. Kimball, president.
W. P. Cosgrove, superintendent.
New Orleans and Northwestern R. R.:
John Glynn, jr., general agent.
New York, Ontario and Western Ry.:
Thomas P. Fowler, president.
J. E. Childs, general manager.
H. Anderson, G. F. and P. A.
E. Canfield, superintendent.
E. Minshall, master mechanic.
New York, Providence and Boston R. R.
G. H. Griggs, master mechanic.
North Pennsylvania Railroad:
F. A. Comly, president.
New Haven and Northampton Railroad:
S. B. Opdyke, jr., superintendent.
Northern Pacific Railway:
T. F. Oakes, V. P. and genl. manager.
J. M. Hannaford, G. F. Agent.
C. S. Fee, general passenger agent.
A. Anderson, chief engineer.
F. Green, superintendent.
J. Blickensderfer, engineer.
F. W. Gilbert, supt. R. M. division.
W. A. Gaslock, master mechanic.
New Orleans Pacific Railroad:
E. B. Wheelock, president.
Robert Strong, secretary.
Ohio and Mississippi Railroad:
W. W. Peabody, president.
C. M. Stanton, asst. superintendent.
W. B. Ruggles, chief engineer.
W. J. Robinson, genl. baggage agent.
Percy Werner, general counsel.
Old Colony Railroad:
Charles F. Schoate, president.
C. L. Lovering, director.
R. W. Turner, director.
C. N. Bliss, director.
John J. Russell, director.
G. A. Gardener, director.
John S. Braglin, director.

Old Colony Railroad—Continued.
Thomas Dunn, director.
Thomas J. Borden, director.
Oregon and California Railroad:
R. Woelden, recr. and genl. manager.
J. Brandt, general superintendent.
G. H. Andrews, second v. president.
E. P. Rogers, C. P. and P. agent.
Oceanic Steam-ship Company:
J. D. Spreckels & Bro., general agts.
Oregon Railway and Navigation Co.:
Goodall, Perkins & Co., general agents.
Pacific Improvement Company:
F. S. Douty, secretary.
Pacific Coast Railway:
J. M. Filmore, manager.
Philadelphia, Wilmington and Baltimore Railroad:
Isaac Hinckley, president.
J. M. Mills, superintendent.
A. Feldpanche, engineer.
L. M. Allibone, assistant engineer.
Philadelphia and Erie Railroad:
Thomas A. Roberts, superintendent.
E. B. Westfall, superintendent.
Joseph R. Davis, assistant engineer.
D. H. Lovell, assistant engineer.
Isaiah Paxon, master mechanic.
W. L. Holman, master mechanic.
Philadelphia and Reading Railroad:
H. K. Nichols, chief engineer.
W. Hunter, assistant engineer.
E. F. Smith, chief assistant engineer.
J. V. Smith, prest. E. Penn. Div.
O. M. Weand, engineer of canals.
George Eltz, superintendent trans.
G. A. Shaffer, general baggage agent.
J. Lowrie Bell, gen. traf. manager.
James Calhoun, gen. freight agent.
Peoria, Decatur and Evansville Railroad:
G. L. Bradbury, vice-president.
R. A. Bunker, treasurer.
H. C. Parker, traffic manager.
Providence and Worcester Railroad:
James Callery, president.
H. D. Campbell, sect'y and treasurer.
C. S. Wight, general freight agent.
J. Morton Hall, purchasing agent.
W. M. Flahaven, master mechanic.
Joseph Johnson, superintendent.
J. L. Kirk, auditor.
C. H. Bassett, gen. passenger agent.
J. H. Agnew, general foreman shops.
M. L. Cronlish, act'g gen. fr't agent.
Pennsylvania Company:
T. D. Mesler, vice-pres't and comp.
J. M. Kimball, superintendent.
G. S. Morris, superintendent.
Charles L. Cole, A. G. F. agent.
H. W. Byers, road-master.
Pennsylvania Railroad:
G. B. Roberts, president.
Frank Thomson, 2d vice president.
N. D. DuBarry, 3d vice president.
John P. Green, 4th vice president.
John C. Sims, jr., secretary.
John D. Taylor, treasurer.
Charles E. Pugh, general manager.
T. N. Ely, genl. supt. M. P.
Alexander M. Fox, director.
Henry D. Welsh, director.
H. H. Houston, director.
John P. Wetherill, director.
N. Parker Shortridge, director.
Wistar Morris, director.
J. T. Richards, asst. chief engineer.
R. E. Pettit, general superintendent.
F. Wolcott Jackson, general supt.
Jos. Crawford, superintendent.
W. N. Bannard, superintendent.
Frank Ellmaker, superintendent.
O. E. McClellan, superintendent.
A. P. Kirkland, superintendent.
J. B. Hutchinson, superintendent.
Wilson Brown, superintendent.
Alfred Walter, superintendent.
J. A. Anderson, supt. relief dept.
Frank Sheppard, supt. M. P.
H. S. Hayward, supt. M. P.
S. M. Prevost, general supt. trans.
J. R. Wood, general passenger agent.
G. W. Boyd, asst. gen. pass. agent.
L. P. Farmer, N. E. pass. agent.
Enoch Lewis, purchasing agent.
M. P. Sargent, asst. genl. purc. agent.
F. J. McWade, general baggage agent.
R. W. Downing, comptroller.
James Reed, superintendent.
M. Riebenack, assistant comptroller.
O. J. Geer, general agent.
C. S. Worts, road foreman engineers.
Joseph U. Crawford, chief engineer.
Samuel W. Latta, chief medical exr.
M. W. Thomson, engr. mach. works.
W. M. Phillips, superintendent.
E. F. Brooks, engr. maintenance of way.
Richmond and Danville Railroad:
F. W. Huidekoper, vice-president.

Richmond, Fredericksburgh and Potomac Railroad:
Jos. P. Briton, president.
E. T. D. Myers, genl. superintendent.
J. B. Winston, treasurer.
Richmond and Alleghany Railroad:
Decatur Axtell, receiver and manr.
E. R. Leland, secretary.
Rome, Watertown and Ogdensburgh R. R.:
H. W. Britton, general manager.
W. W. Currin, supt. transp.
T. M. Petty, general baggage agent.
F. R. Becker, chief engineer.
G. H. Hazleton, superintendent.
G. C. Gridley, A. G. P. agent.
T. H. Austin, tax agent.
C. L. Martin, auditor.
E. M. Moore, general freight agent.
H. A. Smith, road-master.
Saint Louis, Alton and Terre Haute R. R.:
W. Bayard Cutting, president.
G. W. Parker, V. pres. and gen. man.
Saint Louis and San Francisco Railway:
D. W. Nichols, general supt.
James Dunn, chief engineer.
Wm. A. Thomas, division supt.
Saint Paul, Minneapolis and Manitoba Ry:
E. B. McKennan, asst. gen. supt.
C. H. Jenks, superintendent.
A. Githens, superintendent.
Elmer L. White, secretary.
South Florida Railroad:
J. E. Ingraham, president.
F. H. Rand, general superintendent.
R. R. Swoope, superintendent.
Wilbur McCoy, auditor.
Saint Louis and New Orleans Anchor Line:
J. B. Woods, general agent.
Shenango and Allegheny Railroad:
J. T. Blair, president.
P. E. McCray, auditor.
Seaboard Air Line Railroad:
John C. Winder, general manager.
Steam Packet Co.; Seaboard and Roanoke Railroad; Raleigh and Gaston Railroad; Raleigh and Augusta Air Line; Carolina Central Railroad Co.
William M. Robinson, president.
Southern Transportation Co.:
A. M. Calliday, general agent.
Star Union Line:
John H. Moriarity, agent.
Saint Louis, Fort Scott and Wichita R. R.:
J. W. Miller, vice-president.
J. H. Richards, general attorney.
J. W. Dowland, secretary.
Saint Paul and Duluth Railroad:
W. H. Rawn, vice-president.
Shenandoah Valley Railroad:
G. R. W. Armes, treasurer.
Southern Pacific Railroad:
A. C. Hutchinson, general manager.
A. N. Towne, general manager.
I. Kruttschnitt, assistant manager.
J. H. Willenth, secretary.
J. A. Fillmore, gen'l superintendent.
William Hood, chief engineer.
R. H. Crawford, cont. freight agent.
E. W. Haw, A. G. F. A.
William H. Mills, land agent.
J. G. Schreiver, traffic manager.
N. B. Kellogg, assistant road-master
W. G. Curtiss, superintendent track.
William T. Lambell, engineer.
J. R. Wilkinston, insp. engineer.
E. H. Miller, jr., secretary.
J. C. Stubbs, general traffic manager.
Michael Deering, assistant engineer.
R. H. Pratt, ass't gen'l sup't.
Richard Gray, general freight agent.
Jerome Madden, land agent.
C. J. Wilder, freight auditor.
E. C. Wright, general auditor.
Texas and Pacific Railway:
L. A. Shelden, receiver.
Eugene H. Hinton, comm'l agent.
Texas and Saint Louis Railway:
S. W. Fordyce, receiver.
H. G. Arlis, comptroller.
S. B. Fish, agent for receiver.
H. A. Young, chief engineer.
Ulster and Delaware Railroad:
J. H. Jones, general superintendent.
Union Switch and Signal Company:
C. H. Jackson, president.
Union Pacific Railway:
C. F. Adams, jr., president.
S. T. Smith, general superintendent.
J. Blinchensderfer, chief engineer.
W. W. Fagan, superintendent.
O. H. Dorrance, superintendent.
J. O. Brinkeroff, superintendent.
L. H. Kortz, sup't telegraph
Erastus Young, auditor.
J. A. Monroe, general freight agent.
Thomas L. Kimball, gen. traffic man'r.
C. S. Stebbins, general traffic agent.
J. W. Morse, gen. passenger agent.
Ulster and North Carolina Railroad:
A. B. Andrews, president.
Wallkill Valley Railroad:
G. M. Graves, superintendent.

Westinghouse Air-Brake Company:
George Westinghouse, jr., president.
Wheeling and Lake Erie:
C. A. Wilson, chief engineer.
Joseph M. Hall, gen'l passenger ag't.
A. G. Brown, general freight agent.
A. H. Thorpe, cashier.
W. R. Woodford, purchasing agent.
Otto Swartz, assistant chief engineer.
M. D. Woodford, receiver.
S. H. Ayers, secretary.
West Jersey Railroad:
R. Stretch, general express agent.
Western Maryland Railroad:
J. M. Hood, president.
John S. Harden, secretary.
B. H. Griswold, gen. fr't and pas. ag't.
Wilmington and Northern Railroad:
H. A. Du Pont, president.
West Shore Railroad:
J. D. Layng, general manager.
C. W. Bradley, general sup't.
D. B. McCoy, superintendent.
J. P. Bradfield, superintendent.
Western Transit Company:
S. D. Caldwell, general manager.
Wabash, St. Louis and Pacific Railway:
Thomas Anderson, general foreman.
R. A. Houghton, road-master.
George F. Bidwell, assistant sup't.
A. B. Adams, road-master.
F. Sullivan, road-master.
G. W. Stevens, superintendent.
W. V. Stuart, attorney.
J. S. Goodrich, master transportation.
Zanesville and Ohio Railroad:
James Buckingham, president.
Edw. A. Green, chief engineer.
Chicago, St. Louis and Pittsburgh R. R.:
C. B. Taylor, superintendent.
Leroy Kells, master mechanic.
William Stewart, gen'l freight ag't.
Robert Curtis, master mechanic.
Edw. B. Wall, superintendent.
Charles B. Street, master mechanic.
William Swanston, master mechanic.
W. W. Reynolds, master mechanic.
Woodruff Sleeping-Car Company:
John C. Paul, general manager.
Pittsburgh Locomotive Works:
F. G. Dickson, president.

At the stated meeting of the Franklin Institute of Philadelphia, held Wednesday, June 16, 1886, the following preamble and resolution were unanimously adopted, viz:

Whereas a petition signed by over eleven hundred prominent railway officials of the United States has been presented in the House of Representatives by the Hon. J. B. Everhart, and referred to the Committee on Appropriations, which petition reads as follows:

"*To the Congress of the United States:* The undersigned, desirous of perpetuating the history of the birth and development of steam transportation (by steam-boat and railway in America) respectfully petition your honorable body to appropriate such a sum of money as may be deemed necessary to carry out the plan recently adopted for the organization of the section of steam transportation in the U. S. National Museum, said sum to be expended under the supervision of Prof. Spencer F. Baird, Secretary of the Smithsonian Institution and Director of the U. S. National Museum:" Therefore,

Resolved, That the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts most heartily and cordially concurs in the purpose and objects of this petition, and respectfully requests favorable action thereon.

Adopted.

Attest:

WILLIAM H. WAHL,
Secretary.

During the remainder of the fiscal year I spent such time as could be spared from duties connected with the railway service in installing and classifying objects collected while abroad and in correspondence with railroad officials and others interested in the development of the sec-

tion. I judge from the interest shown by them that the nucleus which we have at the end of the first year of the existence of the Section of Steam Transportation can be rapidly expanded into a collection which shall properly illustrate the history of the birth and development of the steamship and railroad when it shall be practicable to organize the section upon a basis commensurate with its importance.

REPORT ON THE SECTION OF MATERIA MEDICA IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By H. G. Beyer, M. D., *U. S. Navy, Honorary Curator.*

In performing the somewhat peculiar and more or less difficult task of arranging and classifying the collection of materia medica specimens for the purpose of exhibition, two objects are constantly being kept in mind, namely: (1) To make the collection both attractive and instructive to the general public, giving them an easy reference to any specimen on which they may desire information, and (2) to afford the student of medicine and pharmacy the opportunity of studying materia medica in all its details.

Every specimen of drug on exhibition is accompanied with a small but concise so-called specific label, which is more especially intended to describe the drug itself as it appears in the market. This label will be found attached to the square block upon which the bottle containing the specimen is placed. A second kind of label, which may be termed the generic label, is much larger, and the instruction which it is intended to give comprises the characters peculiar to an entire genus. The third label is also a large one, and gives a description of each larger group of plants to which the specimens belong. This will be found at the beginning of each new group in the exhibition cases.

It is intended, finally, to have every specimen illustrated in the following way: (1) By a well-preserved and mounted herbarium specimen of the plant from which the specimen is derived. (2) By a colored plate, profusely illustrating not only the entire plant, in as nearly its natural state as can be shown by plates, but also the anatomy of all its parts. (3) By a picture showing the peculiar microscopical structure of the different constituents of each plant. Every one of these pictures will in time be provided with a label which shall be descriptive of whatever it is intended to elucidate.

This work, of course, will require some time to fully accomplish. At present we are by no means in the possession of all the colored plates and herbarium specimens needed to illustrate every specimen in the above-described manner, and their collection, in many instances, is a

mere matter of chance; but a great deal can be done to expedite the accomplishment of the object.

Much time has been already devoted to the large descriptive catalogue which we contemplate writing, and which is intended not only as a guide for the general visitor and the student of medicine and pharmacy resident at Washington, but which shall also give to druggists and non-resident medical men valuable information on all the rare drugs contained in the collection. This work has been progressing but slowly for the reason that the library of this section of the Museum is not yet provided with the books which are indispensable to complete a work of this kind.

The remainder of the routine work consists in registering, examining, identifying, and bottling the specimens which are from time to time sent in for exhibition purposes. The writing of labels for new specimens, as well as making constant improvements on old ones, is a continuous source of work.

The invasion of the specimens by insects is prevented in the usual way, by placing blotting-paper, moistened with chloroform, into the respective bottles, and this process so far has answered the purpose very well indeed.

A list of the papers published in relation to the material and work of this department has been furnished for the bibliography, and it is therefore unnecessary to repeat them in this place.

Up to last year the arrangement of the specimens was only according to the natural orders as they are found in Bentham and Hooker's Genera Plantarum. The change which has been made this year in the classification is deemed of some importance, *i. e.*, that each genus is placed in the order in which it occurs in the above-mentioned work.

The number of specimens now on exhibition is 3,326, of which 1,457 have printed specific labels. In order to enable the curator to label the remainder of the collection, a few more books of reference must be provided. The illustration of the specimens by properly mounted colored plates and herbarium plants is still in progress, and will occupy a few months more.

The following is a list of specimens, representing the more important and rare drugs which were received and entered on the register:

FROM THE GOVERNMENT OF JAMAICA.

Amyris balsamifera.
Mucuna pruriens.
Cassia oborata.
Calotropis gigantea.
Rhizophora mangle.
Ipomoea purga.
Avicennia nitida.
Gouania domingensis.
Laguncularia racemosa.
Cissampelos Pereira.
Cyperus articulatus.
Capparis cynophallophora.
Smilax china.
Mikania guaco.
Bocconia frutescens.
Croton cascarilla.
Andira inermis.

FROM THE MEXICAN EXHIBIT AT NEW ORLEANS EXPOSITION, 1884–'85.

Contrayerba.
Faban vegetal.
Panita.
Valerian, and dried specimens of the saffron plant—
Crocus sativa.
Balsamo prieto.
Balsamo negro.
Krameria.

FROM THE JAPANESE EXHIBIT AT NEW ORLEANS EXPOSITION, 1884–'85.

Oil of peppermint.
Daphne Genka.
Artemisia capillaris.
Schizandra chinensis.
Ophiopogon spicatus.
Kaolin.
Cornus officinalis.
Tritillaria Thunbergii.
Trichosanthes japonica.
Bupleurum falcatum.
Dioscorea triphylla.
Amanhura aspholoides.
Platycodon grandiflorum.
Rehmannia luta.
Asarum variegatum.
Pinella tuberifera.
Xanthoxylum piperitum.
Cocculus Thunbergii.
Astragalus lancea.
Citrus fusca.
Ligusticum acutilobum.

FROM MR. F. STERNS, DETROIT, MICH.

Mammea americana.
Kola paste.
Plumeria alba.
Myristica surinamensis.
Melia azedarach.
Eupatorium aya-pana.
Agar Agar, Japanese.

FROM DR. E. PALMER.

Persea caroliniensis.
Erythræa tridentata.
Tagetes micranthea.
Tagetes lucida.
Cedronella cana.
Vitis arizonica.
Hilaria cenchoides.
Liatris odoratissima.
Eleomurus candidans.
Salvia scorodonifolia.

FROM W. S. THOMPSON, WASHINGTON, D. C.

Oil of peppermint.
Pipmenthol.

REPORT ON THE DEPARTMENT OF MAMMALS IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By FREDERICK W. TRUE, *Curator.*

The accessions received by this department during the year number ninety-two, and are for the most part of much interest. In reviewing the more important of these I have separated them into two principal classes, viz., *terrestrial* and *aquatic* mammals.

The collection of indigenous mammals of the United States has been enriched by the addition of two skins of the black-footed ferret, *Putorius nigripes*, collected by Mr. A. B. Baker in Trego County, Kans. This species is perhaps the rarest of North American mammals, and the addition of new skins to our series is a matter of considerable moment.

Several interesting collections were received from California and Oregon, the most extensive being that of Mr. Walter E. Bryant.

A good skeleton of the common black bear, previously wanting to the collection, was prepared from the carcass of an individual which died in confinement in the grounds of the Government Asylum for the Insane, Washington.

Messrs. Barnum, Bailey, and Hutchinson, the well-known circus proprietors, have during the past year placed the Museum under fresh obligations by their donations of valuable specimens of some of the larger species of exotic mammals. Prominent among their gifts is the Indian elephant "Albert," which was killed at Keene, N. H., in July, 1885, on account of its exhibiting signs of insanity. Albert was an elephant of large size, his height at the shoulder being 8 feet, 4 inches. The skin, which is in an excellent state of preservation, will probably be mounted during the coming year. Other valuable specimens received from these gentlemen were a leopard, a zebra, a llama, a blau-bok, and a kangaroo. A very fine female tiger was also purchased from them for a small sum. All these, with the exception of the kangaroo, represent species new to the collection.

Mr. Lewis Sells, of Cincinnati, presented a skeleton of an eland, *Oreas canna.*

Mr. A. E. Brown, superintendent of the Philadelphia Zoological Gardens, and Dr. W. A. Conklin, superintendent of the Central Park

Menagerie, New York, have presented many valuable specimens. Notable among those received from the former gentleman was an ibex, *Capra ibex*, a well-known European species and one whose extermination seems imminent. Dr. Conklin presented, among many valuable specimens, two hog deer, *Cervus porcinus*.

A series of five young Greenland seals, obtained by Dr. C. Hart Merriam from Labrador, and a number of fur seals and one specimen of Steller's sea-lion, collected by Mr. C. H. Townsend in St. Paul's Island. Alaska, together with another of the latter species obtained by Dr. Stejneger in Bering Island, were the only pinnipeds received this year.

Dr. Leonhard Stejneger obtained from M. Grebnitzki, in Bering Island, and presented to the Museum, a skull of a bottle-nosed whale, believed to be *Ziphius grebnitzki* Stejnr., and the skeleton of a young killer, *Orca* sp. From the United States life-saving stations not so many cetaceans were received as during the two previous years. The collection was enriched, however, by a fœtal and an adult female pygmy sperm whale, obtained respectively by Keeper L. T. Grimm, of Loveladies Island, New York, and Keeper J. W. Ridgway, of Barnegat City, New Jersey.

Keeper J. R. Hobbs captured a common dolphin, *D. delphis*, and Mr. C. H. Townsend collected a skull of the same species on the California coast. The latter collector also obtained a fine specimen of the baleen of the California gray whale.

In the Exhibition Hall the only new case added during the past year was that built for the group of fur seals presented to the Institution a number of years ago by the Alaska Commercial Company. This case is larger than any hitherto built, except the wall-cases, and is furnished with exceptionally large glasses. It corresponds in design with the Orang case, and will be placed opposite the latter at the north end of the hall, previously erected, or in the center.

The two large groups of ruminants and seals were placed against the south wall. They are unprovided with railings, or other means of protection, and the arrangement can not be regarded otherwise than temporary. The curator has spent much time and thought upon the consideration of plans for cases suitable for large specimens, but has not as yet hit upon any satisfactory designs. It is quite probable, however, that it will be found necessary to extend the large wall-cases now in the hall.

Experiments have been made looking toward a better installation of the cetacean casts than the present one. It has been deemed best to arrange them on a raised base upon the top of the wall-cases. A sample section of the proposed base was made and placed in position, and it is to be hoped that the whole re-arrangement will be effected during the coming year.

The mounted specimens added to the exhibition series during the year were chiefly ruminants and marsupials. Very few small species

were mounted. In addition to the work upon the new specimens, much repairing and restoring was done. A number of specimens furnished by the taxidermists could not be placed on exhibition for want of pedestals. The species added to the exhibition series during the year were as follows:

St. Bernard Dog.
Wolf, *Canis lupus griseo-albus.*
Fallow Deer (albino), *Dama vulgaris.*
Prong-horn Antelope (head), *Antilocapra americana.*
Kamtschatkan Sheep (head), *Ovis nivicola.*
Indian Sheep (head), *Ovis cycloceros.*
Barbary Wild Sheep, *Ovis tragelaphus.*
Japanese Goat-Antelope, *Nemorhedus crispus.*
Harnessed Antelope, *Tragelaphus scriptus.*
Bonte-Bok, *Damalis pygarga.*
Water Buck, *Kobus ellipsiprymnus.*
Llama, *Auchenia llama.*
Zebra, *Equus burchellii.*
Kangaroo Rat, *Dipodomys phillipsii.*
Coypu Rat, *Myopotamus coypu.*
Tree Porcupine, *Synetheres prehensilis.*
Dugong, *Halicore dugong.*
Giant Kangaroo, *Macropus giganteus.*
Kangaroo (unidentified), *Macropus* sp.
Red Kangaroo *Macropus rufus.*
Great Rock Kangaroo, *Macropus robustus.*
Black-Striped Wallaby, *Halmaturus dorsalis.*

Additional temporary labels were prepared, and the majority of the specimens are now labeled. The identification of some of the exotic species is attended with great difficulty and consumes a large amount of time.

The series of lithographic pictures of thoroughbred cattle, published by the French Government in 1861, have been framed and placed on exhibition.

It is probable that considerable changes in the appearance of the exhibition hall will be brought about before the end of another year by the adoption of new portable cases and the remodeling of the wall-cases.

A very important as well as very necessary change in the arrangement of the study series was made possible by the erection in the laboratory of a large storage case for skins. This case is 11 feet high and 13½ feet wide and is divided into six compartments. As at present arranged, it contains one hundred and thirteen standard drawers of various depths from 3 to 12 inches. The case contains the entire collection of unmounted skins, except the ungulata, pinnipedia, marsupialia, the larger carnivores, and the rabbits. The larger species are simply placed in deep drawers, each drawer having its proper label. The smaller species, on the other hand, are arranged separately in paper trays, which are in turn placed in shallow drawers.

The preliminary card catalogue of skins and alcoholics, begun some time ago under unfavorable circumstances, has been completed.

The alcoholic collection remains in the same condition as when last reported upon. The jars for repacking, and thereby condensing, the collection have been received, but the work has not been begun. When the series was removed to a new quarter of the laboratory to make room for the storage cases for skins, fresh alcohol was added to such speci-

mens as seemed to need it. Shelves for the storage of empty jars have been erected and prove a great convenience.

Only an insignificant number of specimens, with the exception of the *Soricidæ*, remain unidentified. It has been deemed best to postpone the identification of the shrews until the publication of the third part of Dr. G. E. Dobson's work upon the insectivora, which will probably appear during the coming year.

The registers are complete to date, so far as the curator is aware.

During the fall a considerable number of worthless specimens were removed from the collection and destroyed. This was done only after very careful examination of the records, and with the consent of the director.

The curator has had the assistance, as hitherto, of a single clerk, Dr. W. G. Stimpson. He has continued to act as before in the capacity of librarian and curator of the department of Comparative Anatomy and also as secretary of the advising committee on publications. The force of taxidermists was reduced in the spring to two by the resignation of Mr. J. Richardson.

The curator has continued his studies upon the toothed whales during the year and has published several papers, which, together with other papers based partly on museum material by naturalists not connected with the Museum, are noticed in Part IV of this report. (*See* under C, Hart Merriam, R. W. Shufeldt, and Frederick W. True.)

In May, by invitation of the U. S. Commissioner of Fish and Fisheries, the curator visited the porpoise fishery of the Wilmington Oil and Leather Company at Hatteras, N. C., and obtained much valuable information regarding the life-history of the Bottle-nosed Dolphin, *Tursiops tursio*, which is caught in great numbers at that point for the manufacture of leather and oil.

The Alaskan collections of Mr. E. W. Nelson and the late C. L. McKay were identified, and annotated lists of the species were prepared. The notes upon Mr. Nelson's collection will be published in his report; those relating to Mr. McKay's collection, in the *Proceedings* of the Museum.

In the course of his work upon Mr. Nelson's specimens the curator had occasion to compare the skulls of the American species of Lynx and was fortunate enough to discover certain cranial characters which render *L. canadensis* readily distinguished from *L. rufus* and its varieties. The discovery was made the subject of a note in Science, Vol. VII, p. 396.

During an examination of the collection of insectivores a single specimen of an apparently undescribed mole from Japan was found. A description of the specimen has been prepared for the *Proceedings* of the Museum, under the name of *Dimecodon pilirostris*.

The curator has also made a new study of the Kangaroo Rats (*Dipodomys*) resulting in the establishment of two species, *D. phillipsii* (Gray) and *D. agilis* Gambel, the former having four toes on the hind foot, and *the latter* five.

The usual amount of work has been done in the identification of specimens sent to the Museum for that purpose by persons in different parts of the country.

Numerous requests for technical information have been received and responded to. Some information was given Dr. G. E. Dobson relative to the dentition and cranial characters of *Sorex hoyi*, *S. crawfordi*, and *S. erotis*.

The curator has been in correspondence with Mr. A. E. Brown, superintendent of the Philadelphia Zoological Garden, relative to the specific distinctions of the smaller American deer, and with Dr. E. C. Spitzka relative to the commonest species of dolphin to be met with on the Atlantic coast. Mr. G. H. Ragsdale, of Gainesville, Tex., has received various information in regard to the mammals of that State. A request from Dr. Alfred Nehring, of Berlin, for a list of the specimens of *Galictis* in this Museum was responded to. The facts relating to the periodical shedding of the antlers by *C. virginianus* and other species of deer, were sent to Mr. C. C. Smith, of Compton, Pa.

Several requests for information relative to methods of preserving specimens were received and responded to by the curator or chief taxidermist.

The number of mounted skins exhibited on January 1, 1885, and at the present date is as follows:

On exhibition January 1, 1885	646
On exhibition June 30, 1886	735

It is necessary to state regarding these figures that they do not indicate the real increase of the exhibition series. The collection contains a certain proportion of much-deteriorated specimens. Some of these, which have been exposed to the light on one side only for a score or more of years, are very unsightly, the color being much faded on the side which has been exposed, while on the other side the original tints are preserved. These specimens are unfit for exhibition and must necessarily be withdrawn from the exhibition series. The gradual substitution of new specimens for old and faded ones, the removal of others without replacement, and the addition of specimens entirely new, are operations which are carried on simultaneously, and it is therefore somewhat difficult to indicate the real increment. The last figures given above simply show that there were on exhibition at the close of the fiscal year (1885–'86) 735 mounted skins of mammals. The number of new specimens actually completed by the taxidermists and placed on exhibition during the year was 22, including 3 heads.

The improved facilities in the laboratory have made possible an actual count of all the specimens in the collection. Such an enumeration was undertaken at the close of the year, with the following results:

Exhibition series of skins	735
Duplicate and study series of skins	3,862
Alcoholic specimens	2,854
Total	7,451

These figures may be relied upon as indicating the actual number of specimens in the collection, and supersede those given in previous reports, which were partly based upon estimates.

The statistics of skins and alcoholic specimens added, distributed, and destroyed during the year are as follows:

Specimens added to the collection	381
Specimens distributed	100
Specimens destroyed	113

The last entry-number in the register in June, 1885, is 15,075; the last number June 30, 1886, is 15,482.

REPORT ON THE DEPARTMENT OF BIRDS IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By ROBERT RIDGWAY, *Curator.*

SKINS AND ALCOHOLIC SPECIMENS.

The number of birds, chiefly skins, which were added to the collection during the year ending June 30, 1886, is 4,147 (Museum register 104914 to 109060, inclusive). The more important accessions* were the following:

Baird, Prof. S. F., Director U. S. National Museum: Pelagodroma marina (1 specimen); a rare Petrel collected off the coast of Massachusetts, and new to the North American fauna. (Gift.)

Bartlett, Edw., England: 96 specimens, 67 species, from different parts of the world, but mostly from Australia. The collection embraces many interesting forms new to the Museum, among others, not less than four species of *Pardalotus*, thus nearly completing the series in the Museum of this peculiar Australian genus. (Exchange.)

Batchelder, Charles F., Cambridge, Mass.: a pair of a recently described *Junco* from North Carolina (*J. hiemalis carolinensis*), new to the collection. (Exchange.)

Beckham, Charles W., Washington, D. C.: 1 albino ♂ Redhead Duck (*Aythya americana*) purchased for the Museum in Centre Market, Washington.

Belding, L., Stockton, California: 13 specimens, 9 species, from California, among them 2 specimens of the hitherto undescribed and unknown male of *Colaptes rufipileus* from Guadalupe Island. (Gift.)

Bendire, Capt. Charles E., U. S. Army: 30 specimens, 19 species, from the vicinity of Fort Custer, Montana. A very acceptable accession. (Gift.)

Bendire, Capt. Charles E., U. S. Army: 1 specimen of *Melospiza fasciata* from Fort Custer, Montana. (Gift.)

Benedict, J. E., U. S. Fish Commission Steamer Albatross: 16 specimens, 5 species, in alcohol, taken in the North Atlantic. (U. S. Fish Commission.)

Benedict, J. E., and W. Lee, U. S. Fish Commission Steamer Albatross: 3 specimens, 2 species, taken in the North Atlantic. (U. S. Fish Commission.)

Berlepsch, Hans Graf v., Münden, Germany:† 60 specimens, 50 species. A valuable and interesting collection, consisting chiefly of the desiderata from South America, among which are some types of several new species recently described by the sender. Nearly all the species are new to the collection. (Exchange.)

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* In addition to the accessions here enumerated, many others of equal importance were received and are referred to in Part v of the report. These are not included in this list, since their mention here would only be a repetition of what is said concerning them in Part v.

† For complete list of specimens included in this collection, see Accession List, Pt. v.

Brown, Arthur Edwin, Superintendent Zoological Gardens, Philadelphia, Pa.: 1 specimen of Whitney's Owl, in the flesh. (Gift.)

Brown, Arthur Edwin, Superintendent Zoological Gardens, Philadelphia, Pa.: 1 East Indian Parakeet, *Palæornis eupatrius*, in the flesh. (Gift.)

Coale, H. K., Chicago, Ill.: 26 specimens, 24 species, chiefly from South America and India, among them several species not heretofore represented in the collections of the Museum. (Exchange.)

Hamlin, J. P., Washington, D. C.: 2 live young *Syrnium nebulosum*, from Montgomery County, Md. (Gift.)

*Hargitt, Edward, Chiswick, England:** 105 specimens, 41 species, mostly water-birds from France and the Orkneys. 2 fine specimens of *Megalestris skua*, ♂ and ♀, are especially noteworthy. (Exchange.)

Johnson, J. W., U. S. Signal Service, Nushagakh, Alaska:* 71 specimens, 19 species, from Nushagakh, including 2 specimens of the recently discovered *Pleotrophenax hyperboreus*. (U. S. Signal Service.)

*Dugés, Prof. Alfred, Guanajuato, Mexico.:** 28 specimens, 27 species, from southern Mexico. (Gift.)

*Dugés, Prof. Alfred, Guanajuato, Mexico.:** 11 specimens, 11 species, from Mexico. (Gift.)

*Fox, Dr. W. H., Washington, D. C.:** 7 specimens, 6 species, from New Hampshire. (Exchange.)

*Gueade, M. Louis, Museum L'Herminier, Guadeloupe, West Indies:** 25 specimens, 22 species, mostly water birds from Guadaloupe. The most interesting is a specimen of *Speotyto guadeloupensis*, a species new to the collection. (Gift.)

Johnson, J. W., U. S. Signal Service, Nushagakh, Alaska: 34 specimens, 15 species, from Nushagak; nothing rare, but the specimens are nicely prepared. (U. S. Signal Service.)

Jordan, Prof. D. S., President Indiana University, Bloomington, Ind.: 43 specimens, 37 species, from the Lower Amazon. Thirteen of these species are entirely new to the collection. (Gift.)

Lawrence, George N., New York City: Type specimen of *Sporadinus bracei* Lawr., from Andros Island, Bahamas. (Gift.)

Lloyd, W., Toyah, Tex.:† 9 specimens, 8 species, Passerine birds from Fort Davis, Tex. (Gift.)

Marshall, Henry, Laurel, Md.: 1 mounted specimen of the European Teal, *Nettion crecca* (♂ ad.), shot in the Potomac River, near Washington, in April, 1885. (Purchased.)

Mason, Prof. O. T., U. S. National Museum: 8 mutilated specimens of South American birds (3 species) used as ornamental appendages to an Indian belt. They have all been described as new by the curator, and are probably from an unexplored district of northern South America. (Department of Ethnology, U. S. National Museum.)

Maynard, C. J., Boston, Mass.:† 10 specimens, 3 species, from Florida, among them a fine pair of *Anas fulvigula*. (Purchased.)

The Mexican Geographical and Exploring Commission,§ through Prof. F. Ferrari-Perez: 95 specimens, (mounted mostly in excellent style), 59 species, collected in the States of Puebla and Vera Cruz, Mexico, forming part of the Mexican Government exhibit at New Orleans. A very valuable acquisition, especially on account of the excellence of mounting. Several species are thus for the first time added to the exhibition series, while many old and poorly mounted specimens have been replaced by those of the present collection. (Exchange.)

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* For complete list of specimens included in this accession, see Accession List, Pt. v.

† For further information concerning the specimens, see Accession List, Pt. v.

‡ For list of specimens, see Accession List, Pt. v.

§ For further information concerning this accession, see Accession List, Pt. v.

The Mexican Geographical and Exploring Commission, through Prof. F. Ferrari-Perez: 50 specimens, 36 species, chiefly from the State of Vera Cruz, Mexico. Includes several plumages new to the collection. (Exchange.)

The Mexican Geographical and Exploring Commission, through Prof. F. Ferrari-Perez: 1 mounted specimen of *Catharista atrata*, and one skin of *Antrostomus vociferus*, both from Mexico. (Exchange.)

Musée d'Histoire Naturelle, Paris, France: 86 specimens, 71 species, chiefly from Madagascar and Cochin China, nearly all new to the collection. This is one of the most important collections received recently, embracing, as it does, a great number of generic types quite peculiar to the island of Madagascar, which the Museum for years has tried in vain to obtain. Among the most noteworthy forms may be mentioned, two *Leptosomus discolor*. *Tylas*, *Cyanolanius*, *Artamia*, *Bernieria*, *Calicalius*, *Vanga*, *Hartlaubia*, *Eurycerus prevosti*, *Geobiastes squamigera*, *Brachypteracias leptosoma*, *Coua*, etc. (Exchange.)

Nutting, C. C., Carlinville, Ill.: 13 specimens, 8 species, from Florida. (Purchased.)

Palmer, William, U. S. Fish Commission: 3 specimens of Common Crossbill, from Escanaba, Mich. (Gift.)

*Ragsdale, G. H. Gainesville, Tex.:** 12 specimens, 7 species, including a fine series of six *Otocoris arenicola*, a *Syrnium nebulosum alleni*, the first specimen of this form taken outside of Florida, and a fine specimen of *Buteo harlani* (the latter purchased, the others being given).

Rey, Dr. E., Leipzig, Germany: 10 specimens, 10 species, from various localities; all new to the collection. (Purchased.)

Ridgway, Robert, Curator, Department of Birds, U. S. National Museum: 259 specimens, 109 species from Wheatland, Ind.; 23 specimens, 14 species from Richland County, Ill.; total, 281 specimens, 123 species. (Smithsonian Explorations.)

Ridgway, Robert, Curator, Department of Birds, U. S. National Museum: 1 snowy owl, *Nyctea nyctea*, shot near Alexandria, Va. (Purchased.)

Roberts, George W., Chester County, Pa.: 27 specimens, 17 species, including a series of 10 *Quiscalus purpureus*, from Chester County, and two young *Syrnium nebulosum alleni* from Florida; collected by Dr. B. H. Warren. (Gift.)

Robinson, Russell, Richmond, Va.:† 1 specimen of albino dusky duck, *Anas obscura*, in flesh. (Gift.)

Shufeldt, Dr. R. W., U. S. Army:† 13 specimens, 9 species, from Fort Wingate, N. Mex. (Gift.)

Shufeldt, Dr. R. W., U. S. Army:† 9 specimens, 7 species, from the vicinity of Fort Wingate. (Gift.)

Shufeldt, Dr. R. W., U. S. Army:† 13 specimens, 4 species of *Junco*, from Fort Wingate. (Gift.)

Smith, Hugh M., Washington, D. C.:‡ 1 specimen, in the flesh, of Old Squaw Duck, *Clangula hyemalis*, shot July 26, at Piney Point, Lower Potomac; 3 Bown-headed Nuthatches, *Sitta pusilla*, and 3 Western Sandpipers, *Ereunetes occidentalis*, from St. George Island, Maryland. (Gift.)

Stearns & Co., Detroit, Mich.:§ 5 specimens, 5 species, from Costa Rica. (Purchased.)

Stearns & Co., Detroit, Mich.: 36 specimens, 27 species, from Bogota, mostly Humming birds. (Gift.)

Stejneger, Dr. L., Assistant Curator, Department of Birds, U. S. National Museum: 1 Snow Goose, from North Carolina, and 4 Nuthatches, from Norway. (Gift.)

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*For complete list of specimens, see Accession List, Part v.

† For further information concerning this accession see Accession List, Part v.

‡ In this entry are included the two accessions numbered 16283 and 16376.

§ For list of specimens see Accession List, Part v.

Stejneger, Dr. L., Assistant Curator, Department of Birds, U. S. National Museum: 21 specimens, 18 species, from Kamtschatka. (Gift.)

*Townsend, Charles H., U. S. Fish Commission:** 243 specimens, 81 species, from Unalashka, Kowak River, and islands of Bering Sea. A valuable collection, including many other interesting specimens, two examples of the recently discovered *Plectrophenax hyperboreus*, obtained on their breeding ground, Hall Island, Bering Sea; and a species of Sandpiper, *Tringa damacensis*, new to North America. (Smithsonian Explorations.)

Townsend, Charles H., U. S. Fish Commission: 156 specimens, 52 species, collected in Humboldt Bay, California. (U. S. Fish Commission.)

U. S. Fish Commission, Naturalists of the Steamer Albatross: 524 specimens, 51 species, mostly from the Bahamas. The collection is of unusual interest as containing not only several forms new to science, but also as extending our knowledge in regard to the distribution of the species on the individual islands, on many of which no collections have been made previously, and in furnishing large series of many species which formerly were poorly represented in the Museum collection.

Warren, Dr. B. H., West Chester, Pa.: 51 specimens, 21 species, in alcohol, from Florida. (Gift.)

Two magnificent donations to the sectional library of the Department of Birds deserve being mentioned in the present connection:

Mr. Henry Seebohm, London, England, has presented to the library a complete copy, text and plates, of Dresser's great work, "The Birds of Europe," which is now bound in fifteen great quarto volumes. This grand work is well nigh indispensable to any one studying ornithology, and the Department is under great obligations to the gentleman named for his munificence.

From Mr. W. E. Brooks, Milton, Ontario, Canada, the Department has obtained a full set of Allan Hume's "Stray Feathers," a journal of ornithology for India and its dependencies, ten octavo volumes. This journal had become a very important desideratum of late years, as the collections of the Museum from the Pacific coasts of the Old World have been very rapidly increasing.

The total number of specimens distributed during this fiscal year was 2,842, as follows:

Specimens sent in exchange	2,581
Specimens loaned for examination	237
Specimens (alcoholic) transferred to the osteological department	24
Total	2,842

Twelve additional cases have been put up and refitted with shelves in order to relieve the overcrowded cases already occupied by the exhibition series, plans and specifications for shelves, etc., for these cases were drawn up, the work superintended, and finally the specimens transferred and arranged, to the very great improvement of the collection. This work was done during the months of July, August, and September.

An important feature of the year's work has been the unpacking, determining, and cataloguing the collection of mounted birds belonging to the Mexican Geographical and Exploring Commission. This excep-

* For list of specimens see Accession List, Part v.

tionally fine collection, as regards preparation of the specimens which had been mounted entirely from fresh specimens, was of very great interest and benefit to the Department, affording, as it did, several suggestions of practical value, and much needed material for study, including no less than five more or less remarkable new species. The collection was in charge of Prof. Fernando Ferrari-Perez, C. E., who prepared a catalogue of the collection for publication in the "Proceedings" of the Museum, the Curator of the Department of Birds determining the species and describing those which were new, besides rendering every needed assistance to Professor Ferrari-Perez. The new species will be fully described in Professor Ferrari-Perez's catalogue, in the forthcoming volume of the "Proceedings," but have already been briefly characterized and named, in order to secure priority, in "The Auk" for July, 1886. The new species are as follows: (1) *Amphispiza ferrari-perezi;* (2) *Pipilo sulmaculatus;* (3) *P. complexus;* (4) *Anas diazi* (named in honor of General Augustin Diaz, president of the Commission); (5) *Philortyx personatus.*

Special reference to the A. O. U. Code and Check-List will be found in the Bibliography, under American Ornithologists' Union.

The collection of mounted duplicates, consisting of more than 7,000 specimens, aggregating about 600 species, was made up into six sets for distribution, set 1 containing 367 specimens and 295 species.

During the year the copy for species labels for the exhibition series was carefully revised to correspond with the nomenclature and numeration of the American Ornithologists' Union check-list, the number of separate labels being about 975. Proof of these was also carefully revised by both the curator and assistant curator.

Several groups of birds which had hitherto been in a state of great confusion were made the subject of special critical revision by the curator, with very satisfactory results, thanks to the excellent material in the Museum collection. Among the more important groups thus covered may be mentioned the particularly different Procellarian genera *Æstrelata* and *Puffinus*, and the genera *Colinus*, *Larus*, *Lagopus*, and *Empidonax*. The last named was revised at the special request of Dr. P. L. Sclater, Secretary of the Zoological Society of London, who is engaged in preparing the catalogue of Tyrannidæ in the British Museum, and who forwarded his own rich collection of *Empidonaces* to aid in the investigation.

The assistant curator has also continued his revision of Japanese ornithology. When Captain Blakiston donated his magnificent collection of Japanese birds to the National Museum, it was with the understanding that it be properly worked up, for which purpose he also left his manuscript notes, accumulated during twenty years collecting, and a great deal of literature, with the assistant curator. Several papers on the Japanese Avifauna have already been submitted for publication by the latter and will be found in the subjoined list of papers

not yet printed. He complains, however, of the great difficulty in settling many important questions for want of Temminck and Schlegel's "Fauna Japonica, Aves."

The following papers have been prepared and submitted

BY THE CURATOR.

(1) The Geographical and Exploring Commission of Mexico. By Fernando Ferrari-Perez, chief of the Natural History section, Pp. MS. 101.

(2) On *Æstrelata sandwichensis* Ridgw. Pp. MS. 2½. (Established as a good species, very distinct from *Æ.* hasitata.)

(3) Description of a new oyster-catcher (*Hæmatopus galapagensis*) from the Galapagos Islands. Pp. MS. 4.

(4) On *Empidochanes fuscatus* (Max) and *Empidonax brunneus* Ridgw. Pp. MS. 2½ (sent to editors of the "Ibis"). [The latter proves to be not only specifically but generically distinct from the former, to which it had been referred by Mr. Salvin, the question being determined by comparison of types of the two species, the former being in the American Museum of Natural History, in New York City.]

(5) Description of a new species of *Empidonax* from Guatemala. Pp. MS. 2 (sent to editors of the "Ibis"). [*E. salvini* Ridgw., based chiefly on specimens in Dr. Sclater's collection, collected by Osbert Salvin, but a specimen in the National Museum made the type.]

BY THE ASSISTANT CURATOR

(1) Review of Japanese birds. I. Woodpeckers. Pp. MS. 81; with a colored plate.

(2) The British Marsh Tit. Pp. MS. 5.

(3) Review of Japanese birds. II. Tits and Nuthatches. III. Appendix to the Marsh Tits. Pp. MS. 71, 1 figure.

(4) Notes on species of the Australian Genus *Pardalotus*. Pp. MS. 9.

(5) On *Turdus alpestris* and *Turdus torquatus*, two distinct species of European Thrushes. Pp. MS. 28.

(6) Description of *Rallus jouyi* sp. nov., with remarks on *R. striatus* and *R. gularis*.

(7) On *Brachyramphus perdix* (Pall.) and its nearest allies. Pp. MS. 18; colored plate.

(8) Additional remarks to a previous paper on *Turdus alpestris*, based upon material received during May. Pp. MS. 1½.

(9) Additional remarks to a previous paper on Japanese Woodpeckers, based upon material received during May. Pp. MS. 2. (Description of *Picus canus perpallidus*, subspecies nova.)

(10) Reviews of Japanese birds. IV. Rails, Gallinules, and Coots. Pp. MS. 51.

An account of the minor and routine work is given herewith in tabular form:

Official letters written	332
Official memoranda	215
Memoranda of packing	189
Orders for work	55
Requisitions for material and supplies	128
Invoices (triplicates)	510
Galleys of proof corrected	142
Pages of proof corrected	1,183
Papers prepared for publication	42
Number of birds mounted for exhibition series	132
Number of birds made into skins	7
Number of mounted birds transferred from the old stands to the new ones	2,006
New walnut stands fitted together	1,261

The papers published during the year by the curator and other investigators, based upon material belonging to the department of birds in the National Museum, are noticed in the bibliography forming Part IV of this report.

An actual inventory of the whole collection of mounted birds and skins was taken, showing the number of specimens in the Museum to be as follows:

(1) Exhibition series	7,000
(2) North American reserve series (including Passeres, Macrochires, Pici, and Coccyges)	12,841
(3) Netropical reserve (including ditto)	11,324
(4) Old World reserve (including ditto)	3,737
(5) Water birds, game birds, raptores, etc. (not separated geographically)	10,973
(6) Duplicates	7,570
(7) Alcoholics (estimated)	2,500
Total	55,945

The reserve series, exclusive of alcoholics, consisted, therefore, of 45,875 specimens at the end of June, 1886.

The reserve skin series at the same time consisted of 38,875 specimens. The different families were represented as follows:

Family.	No. of specimens.		Family.	No. of specimens.	
Ægithinidæ		47	Caprimulgidæ:		
Alaudidæ:			North America	149	
North America	256		Neotropical	94	
Neotropical	7		Old World	19	
Old World	110				242
		373	Cathartidæ		29
Alcedinidæ:			Certhiidæ:		
North America	27		North America	90	
Neotropical	97		Neotropical	3	
Old World	94		Old World	44	
		218			137
Alcidæ		489	Chamæidæ		28
Ampelidæ:			Charadriidæ		485
North America	70		Chionididæ		4
Neotropical	9		Ciconiidæ		13
Old World	14		Cinclidæ:		
		93	North America	44	
Anatidæ		1119	Neotropical	10	
Aphrizidæ		79	Old World	14	
Aramidæ		17			68
Ardeidæ		411	Cœrebidæ:		
Artamidæ		14	North America	2	
Bucconidæ		90	Neotropical	398	
Cancromidæ		10			400
Cariamidæ		1	Columbidæ		524
Capitonidæ:			Colymbidæ		164
Neotropical	41		Conopophagidæ		10
Old World	17		Coraciadæ		11
		58	Corvidæ (crows)		195

Family.		No. of specimens.
Corvidæ (jays):		
North America	463	
Neotropical	212	
Old World	71	
		746
Cotingidæ		332
Cracidæ		106
Cuculidæ:		
North America	55	
Neotropical	223	
Old World	85	
		363
Cursoriidæ		6
Dendrocolaptidæ		498
Dicruridæ		38
Diomedeidæ		31
Dulidæ		3
Eurypygidæ		4
Eurylaimidæ		4
Eupetidæ		3
Falconidæ		1,362
Formicariidæ		514
Fregatidæ		19
Fringillidæ:		
North America	4,205	
Neotropical	583	
Old World	590	
		5,378
Galbulidæ		47
Glareolidæ		8
Gruidæ		30
Hæmatopodidæ		40
Heliornithidæ		3
Hirundinidæ:		
North America	195	
Neotropical	184	
Old World	106	
		485
Ibididæ		53
Icteridæ:		
North America	133	
Neotropical	694	
		827
Laniidæ:		
North America	133	
Neotropical	12	
Old World	215	
		360
Laridæ		997
Leptosomidæ		2
Megapodidæ		4
Meleagridæ		11
Meliphagidæ		150
Meropidæ		17

Family.		No. of specimens.
Micropodidæ:		
North America	29	
Neotropical	56	
Old World	32	
		117
Mimidæ:		
North America	260	
Neotropical	215	
		475
Mniotiltidæ:		
North America	1,560	
Neotropical	875	
		2,435
Momotidæ		71
Motacillidæ:		
North America	141	
Neotropical	24	
Old World	327	
		492
Muscicapidæ		114
Œdicnemidæ		4
Opisthocomidæ		2
Oriolidæ		37
Oxyrhamphidæ		4
Paradiseidæ		11
Paridæ:		
North America	576	
Neotropical	9	
Old World	184	
		769
Parridæ		38
Pelecanidæ		29
Perdicidæ		340
Picidæ:		
North America	991	
Neotropical	427	
Old World	104	
		1,522
Pipridæ		177
Pittidæ		13
Phœnicopteridæ		8
Phæthontidæ		12
Phalacrocoracidæ		112
Phalaropodidæ		141
Phasianidæ		12
Phytotomidæ		7
Plataleidæ		11
Ploceidæ		69
Plotidæ		18
Procellariidæ		152
Promeropidæ		108
Psittacidæ:		
North America	12	
Neotropical and Old World	382	
		394

Family.	No. of specimens.	
Pteroclidæ		6
Pteroptochidæ		27
Ptilogonatidæ:		
North America	20	
Neotropical	31	
		51
Pycnonotidæ		206
Rallidæ		332
Recurvirostridæ		55
Rhamphastidæ		130
Rhynchopidæ		22
Rupicolidæ		5
Scolopacidæ		1396
Spheniscidæ		13
Stercorariidæ		160
Strigidæ		718
Sturnidæ		94
Sulidæ		30
Sylviidæ:		
North America	202	
Neotropical	87	
Old World	514	
		803
Tanagridæ:		
North America	130	
Neotropical	1334	
		1464
Tetraonidæ		475
Thinocoridæ		22
Tinamidæ		54
Todidæ		20
Trochilidæ:		
North America	278	
Neotropical	1506	
		1784
Troglodytidæ:		
North America	369	
Neotropical	343	
Old World	46	
		758
Trogonidæ:		
Neotropical	178	
Old World	11	
		189
Turdidæ:		
North America	590	
Neotropical	342	
Old World	198	
		1130
Tyrannidæ:		
North America	788	
Neotropical	1221	
		2009
Upupidæ		7
Urinatoridæ		85
Vireonidæ:		
North America	275	
Neotropical	304	
		579
Total		38875

The exhibition series consists of about 7,000 specimens, and is decidedly the least satisfactory part of the collection as regards its general utility and chances of preservation. This unfortunate condition of the exhibition series arises from several circumstances wholly beyond control of the Museum authorities, chief of which are the totally unsuitable cases, which are so old and badly constructed that both dust and insects are freely admitted, and the preservation of the specimens seriously jeopardized. Owing also to the faulty construction of the cases, which have stationary shelving and are poorly lighted, it is impossible to make anything like a neat arrangement of the specimens.

Of the 7,000 specimens in the exhibition series, more than 4,500 have been transferred to the new polished black-walnut stands, thus having nearly 2,500 (actually 2,327) which have still to be transferred. None of the new printed labels have yet been attached to the stands, there being no one to do the work.

The condition of this drawer series (study collection and duplicates)—much the larger and more important part—is, as regards preservation from insects, as nearly perfect as possible. The great bulk of the collection is inclosed in suitable drawers, into each of which has been

placed a sufficient quantity of naphthaline, the best known insecticide, 121 pounds of which were required for the purpose. A portion of the collection (including all the duplicates and part of the reserve series) is still included within old and unserviceable cabinets, but requisition has been made for new cabinets to take the place of the old ones. The cabinets (two unit cases and four quarter unit) have been furnished, but not the drawers, which are, of course, even more necessary than the cases themselves.

Alcoholic series.—The condition of this portion of the collection is all that the limited facilities for storage will allow, although the specimens badly need attention, especially with view to their re-arrangement, which under present dearth of help is impossible to give them.

The first entry for the year commencing July 1, 1885, was 104,914, and the last in the catalogue in June, 1886, 109,060.

REPORT ON THE SECTION OF BIRDS' EGGS IN THE U. S. NATIONAL MUSEUM, FOR THE YEAR ENDING JUNE 30, 1886.

By CHARLES E. BENDIRE, U. S. ARMY, *Honorary Curator.*

The accessions during the year embrace, in addition to the eggs, 148 nests, the greater portion of which are very fine specimens, while many are new to the Museum collection. The following are the most important additions:

Anthony, A. W., Beaverton, Oregon: Parus rufescens (6 eggs) and *Perisoreus obscurus* (nest and 5 eggs), new to the Museum and the only ones known so far; both from Beaverton, Oregon; *Scops asio maxwelliæ* (1 egg), from Colorado. (Gift.)

Bendire, Capt. Charles E.: Zonotrichia querula (4 eggs), from Little Horn River, Montana, and *Scops trichopsis* (4 eggs), from Fort Lowell, near Tucson, Ariz. (Gift.)

Gale, Denis, Goldhill, Bowlder County, Colo.: Cinclus mexicanus (nest and 4 eggs). (Gift.)

Goss, Capt. B. F., Pewaukee, Wis.: Nests and eggs (641 specimens, 111 species), some new to the Museum, and all very desirable, including among the rarer species *sterna caspia* (20 eggs in sets of two and three) and *Buteo albicaudautus*, new to the Museum; both from near Corpus Christi, Tex.; *Gymnocetta cyanocephala* (nest and 4 eggs), from Fort Garland, Colo.; *Junco caniceps* (nest and 4 eggs), from Hancock, Colo.; *Regulus satrapa* (nest and 9 eggs), from Grand Menan, New Brunswick; *Helminthophaga chrysoptera* (2 nests and eggs), from South Michigan, and *anas fulvigula* (set of 10 eggs), both new to the Museum. (Exchange.)

Stephens, F., San Bernardino, Cal.: Harporhynchus lecontei (2 nests, 7 eggs), new to the Museum; from California. (Purchased.)

U. S. Fish Commission: Nests and eggs (60 specimens), including the rare *Saurothera bahamensis* (2 eggs), contributed by Mr. J. E. Benedict; collected during the cruise of the U. S. Fish Commission steamer *Albatross* among the Bahama Islands April, 1886.

Wayne, A. T., Charleston, S. C.: Helonia swainsoni (nest and 2 eggs); from near Charleston, S. C. Now to the collection. (Purchased.)

The numbering, classifying, and arranging of 1,508 specimens, taking the record and measurements of 12,000, has been accomplished, a series of mostly duplicate eggs has been placed on exhibition, numbering 1,491 specimens, and a beginning has also been made in exhibiting a series of the nests.

The following figures indicate the number of specimens now in the collection:

	Specimens.
In the reserve collection	31,124
Duplicates	11,548
On exhibition	1,491
Total	44,163

During the year 253 entries have been made on the catalogue book, representing an aggregate of 2,556 specimens.

REPORT ON THE DEPARTMENT OF REPTILES AND BATRACHIANS IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By H. C. YARROW, *U. S. Army, Honorary Curator.*

The most important additions to the Museum in this department for the year have been a collection from Olney, Ill., collected by John and Charles Walker, containing 33 specimens;* a collection from Nicaragua, from Dr. J. F. Bransford, U. S. Navy, containing 191 specimens, which were sent to Prof. E. D. Cope, November 2, 1885; a collection of 471 specimens from E. Wilkinson, Chihuahua, Mexico, also sent to Professor Cope, November 2, 1885; a large collection from the Imperial Academy of Science, St. Petersburg, Russia, containing 118 specimens; from Dr. R. W. Shufeldt, U. S. Army, several good collections from Fort Wingate, N. Mex., consisting mostly of living specimens of Amblystoma.* Collections have also been received from Col. M. McDonald,* Wytheville, Va.; Dr. B. H. Warren, De Land, Fla.; Henry Hemphill, Key West, Fla.; Charles Ruby, southern Kansas; Prof. Alfred Dugés, Guanajuato, Mexico; Miss Dottie Blackburn,* Colorado; John Pollock,* Symmes, Ohio; Dr. T. H. Streets, U. S. Navy, Alaska; Dr. H. C. Yarrow,* coast of North Carolina; G. H. Ragsdale,* Gainesville, Tex.; Capt. Charles Bendire, U. S. Army, Fort Custer, Mont.; Zoological Society of Philadelphia;* several specimens from India; H. W. Henshaw,* Massachusetts; Charles H. Townsend, Humboldt County, Cal.; U. S. Fish Commission steamer *Albatross*;* from the Bahamas; Miss Rosa Smith,* San Diego, Cal., and many others.

The routine work of the Department of Reptiles has been carried on similar to the way described in previous reports, all specimens being carefully attended to and entered in the record books on their arrival. In addition to the general work, over six hundred bottles have been labeled and placed in the cases, in consequence of which the shelves have become very much overcrowded.

No papers have been published by the curator or his assistant. Prof. E. D. Cope has been employed by the Smithsonian Institution on some

* For further information, see Accession List, Part V.

special work, and has been busy all the past winter on the manuscripts of "Manual of Herpetology;" the report on the Batrachia of North America has been completed by Professor Cope to page 650, inclusive. He has also identified all the undetermined Batrachia in the reptile room, and has identified and described the collections made by the various correspondents of the Institution in Mexico, Central and South America.

The following table shows the present extent of the collections:

Number of specimens received during the year	1,705
Number of specimens in reserve series	9,631
Number of specimens in general series	8,819
Exhibition series (selected for)	750
Not classified and exotic specimens, probably	6,134
Total	27,039

The number of the last catalogue entry in June, 1885, was 14148, and in June, 1886, 14592, giving a total of 444 entries during the year.

REPORT ON THE DEPARTMENT OF FISHES IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By Tarleton H. Bean, *Curator.*

All the accessions received during the year are referred to in Part v of the report, so that in this place reference is made only to the most important ones, which are as follows:

Capt. Charles E. Bendire, U. S. Army. (Accession 17222); catalogue 37777–37781. Specimens of fishes from the Big Horn River, Montana, including *Lota maculosa, Hyodon alosoides, Uranidea semiscabra, Noturus exilis, Hybognathus placitus.*

Ensign J. B. Bernadou, U. S. Navy. (Accession 16970); catalogue 37754.* Numerous species of fishes from Corea, which are still undetermined.

E. G. Blackford, New York, N. Y. (Accession 16520); catalogue 37307. A fresh specimen of the Jew-fish, *Promicrops itaiara*, taken near Newport, R. I., which is far to the northward of its usual habitat.

E. H. Bunker, Fletcher's Neck Life-Saving Station. Biddeford Pool, Me. (Accession 17258); catalogue 37081. A specimen of the Argentine, *Argentina silus.* A rare visitor to our coast.

A. N. Cheney, Glens Falls, N. Y. (Accession 16628); catalogue 37313. Some specimens of the Atlantic salmon, which were introduced into Clendon Brook, New York, by the U. S. Fish Commission in 1884.

Daniel T. Church, Tiverton, R. I. (Accession 17308.) A menhaden, *Brevoortia tyrannus*, 3¼ inches long, taken in Narragansett Bay, December 19, 1885. Immense quantities of menhaden were seen in the bay on that date.

F. N. Clark, Northville, Mich. (Accession 17231); catalogue 37785, 37786. A common white-fish, *Coregonus clupeiformis*, and a specimen of *Coregonus tullibee.* The latter is very much desired in the National Museum, as the collection contains only two or three examples.

Prof. A. Dugès, Guanajuato, Mexico.† (Accession 16268). Numerous species of fishes from Mexico, including the following, which are to be described: *Fundulus dugesi, Characodon variegatus, ferrugineus*, and *bilineatus.* (Accession 16401.) Containing numerous additional species, among which are entire specimens of *Moxostoma austrinum*, by which the identification of the Guanajuato sucker with the genus *Moxostoma* is clearly established. The types of this species lacked the air bladder, but the recent examples are perfect.

Vinal N. Edwards, Wood's Holl, Mass. (Accession 17096); catalogue 37580. Several examples of *Apeltes quadracus*, which have the dorsal spines IV, I instead of III, I.

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* For a partial list of these species see Accession List, Part V.

† For further information concerning this accession see Accession List, Part V.

D. M. Etheridge, keeper Currituck Inlet Life-Saving Station; post-office, Knott's Island, N. C. (Accession 17249); catalogue 37790. A specimen in the flesh of the rare shark, *Hexanchus griseus*, which has not previously been obtained on our coast.

I. Garrard, Frontenac, Minn. (Accession 17417); catalogue 37855. A head of the unspotted form of the maskallonge, *Esox nobilior.*

R. A. Golden, Washington, D. C. (Accession 17349); catalogue 37849. A fresh specimen of the land-locked form of the Atlantic salmon, *Salmo salar* var. *sebago*, taken at Ragety Point, lower Potomac River, in a trap-net, by the Faunce Brothers.

*N. Grebnitski, Bering Island, Pacific Ocean.** (Accession 16878.) A fine collection of fishes from Commander Islands, in Bering Sea, containing numerous valuable species, which are at present under examination.

Gwynn Harris, Washington, D. C. (Accession 17371); catalogue 37850. A tench, *Tinca vulgaris*, caught in the Potomac River.

Prof. O. P. Hay, Butler University, Irvington, Ind. (Accession 16219); catalogue 37360–37365. A collection of Florida fishes containing types of several new species. *Zygonectes auroguttatus, Z. nottii*, and *Etheostoma davidsoni.*

Capt. M. O. Healey, U. S. steamer Corwin.† (Accession 16889); catalogue 37382–37385. A small collection of Alaskan fishes, including *Cottus quadricornis*, which is now a well established member of the Alaskan fauna.

E. B. Hodge, Plymouth, N. H. (Accession 16728); catalogue 37357. A brook trout from Lake Sunapee, 22 inches long, 6 inches deep, and weighing 5 pounds. This is a *Salvelinus* of the *oquassa* type, showing few important characters by which it may be distinguished from the blue-back of Maine, except its enormous size. It has been the subject of considerable discussion in the columns of the Forest and Stream, as may be seen by referring to the bibliographical portion of my report.

E. B. Hodge, Plymouth, N. H. (Accession 16835); catalogue 37408–37410. Three additional specimens of the new type of *Salvelinus*, two females and one male, from Sunapee Lake.

Public Museum, Institute of Jamaica, Kingston, Jamaica. (Accession 17165); catalogue 37671–37746. Eighty-two specimens of fishes in duplicate, to be identified, and a representative of each species returned to the Jamaica Museum. Thirty-five species were made out, several of which are new to this collection.

W. B. Johnson, Macon, Ga.‡ (Accession 17697); catalogue 37893. A specimen of the scale carp, *Cyprinus carpio*, weighing 6½ pounds.

Prof. D. S. Jordan, Bloomington, Ind.§ (Accession 17173); catalogue 37747–37750. This small collection contained the type of *Chætodon aya* and of *Hemirhombus athalion.*

Louis Lager, Aberdeen, Dak. (Accession 16921); catalogue 37391. Specimens of *Pimephales promelas* from an artesian well.

William Montgomery, Verona, Mo. (Accession 17210); catalogue 37782–37784. Three specimens of Rainbow trout, *Salmo irideus*, which were introduced into the Ozark region of Missouri by the U S. Fish Commission.

Prof. Félipe Poey, Havana, Cuba. (Accession 16292); catalogue 37411–37578. A very large collection of West Indian fishes, among which are the following types: *Blennius descendens, Chilodipterus affinis, Holocentrum productus, Myxodes paradoxus varius* and *lugubris, Antennarius inops, Pomacentrus niveatus, Pomacentrus brevirostris, Leptoconger perlongus, Tetrodon affinis, Labrosomus microlepidotus.* This collection, contains a very large number of species and is a very important addition to the Museum.

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* For partial list of species see Accession List, Part V.

† For further information concerning this accession, see Accession List, Part V.

‡ For further information concerning this accession, see Accession List, Part V.

§ For further information concerning this accession see Accession List, Part V.

Imperial Academy of Science, St. Petersburg, Russia. (Accession 16354); catalogue 37240–37306. A large collection of identified Russian fishes from the rivers, inland lakes, and border seas of Russia.

Silas Stearns, Pensacola, Fla. (Accession 17177); catalogue 37751. A fine specimen of *Epinephelus flavolimbatus*, which is now said to be the adult form of *E. niveatus* C. and V.

*Dr. T. H. Streets, U. S. Navy.** (Accession 16890); catalogue 37583–37619. Two kegs of Alaskan fishes, containing twenty-eight species.

C. H. Townsend, U. S. National Museum.† (Accession 17146.) A collection of Alaskan fishes principally from Kuwuk River, Northern Alaska. This collection contains the Pike, *Esox lucius*, and the lake trout, *Salvelinus namaycush*.

U. S. Fish Commission. (Accession 16712.) Two tanks and 72 jars of marine fishes from the Atlantic Ocean off Cape Hatteras, Cape Fear, and elsewhere. These fishes have not yet been fully identified. (Accession 17400.‡) Eight tanks, 59 jars, 52 bottles, and 27 vials containing fishes collected by the steamer *Albatross* during a cruise to the Bahama Islands and elsewhere, from February to May, 1886.

E. Wilkinson, Chihuahua, Mexico. (Accesssion 16621.) A small collection of Cyprinodonts, etc. from Mexico, in which is a specimen of *Hadropterus fasciatus*, Girard. As the types of this species are lost this example will enable us to determine the status of the species.

Samuel Wilmot, New Castle, Ontario. (Accession 16687.) Catalogue 37394. Skull of a fish resembling the eelpout, *Zoarces*, found on the north shore of the St. Lawrence River near the St. John's. This may be an undiscovered species of *Zoarces*, whose habitat is uncertain.

The number of entries made in the catalogue of fishes during the year is 662, the first entry in July, 1885, being 37,232, and the last entry in June, 1886, 37,893.

TABULAR STATEMENT.

Months.	Lots of fishes received.	Lots of fish catalogued.	Packages sent out.	Fish drawings examined.
July	4	2	5	4
August	2	1	11	9
September	9	72	4	9
October	12	50	0	11
November	10	20	0	12
December	11	19	0	7
January	10	268	1	10
February	9	113	4	6
March	7	27	2	3
April	4	46	1	5
May	10	13	0	4
June	7	31	3	15

During the year thirty-three papers, based upon material belonging to the department, were published. The list of these is given in the Bibliography (Part IV).

* For partial list of species, see Accession List, Part V.

† For list of species see Accession List, Part V.

‡ For list of species see Accession List, Part V.

Some of the fishes identified and otherwise administered upon are as follows:

A collection from Astoria, Oregon, made by Dr. Augustus Kinney.

Alaskan fishes, collected by Capt. M. A. Healy, steamer *Corwin*.

Alaskan fishes, collected by Dr. T. H. Streets, U. S. Navy.

A second collection of Jamaica fishes, received from the Public Museum of Kingston, Jamaica.

Fishes from the Big Horn River, Montana, collected by Capt. Charles E. Bendire, U. S. Army.

Numerous species from the interior and east coast of Mexico, sent by Prof. A. Dugès.

Fresh-water fishes from Virginia and the District of Columbia, received from Mr. Benjamin Miller.

During the months of August and September the curator accompanied the Assistant Director to the U. S. Fish Commission laboratory at Wood's Holl, Mass., when all the collections from the deep-water fauna, made by the U. S. Fish Commission, were brought together. With the great advantages of ample space and increased facilities for handling large masses of fishes, we were enabled to advance materially the final report, which has for several years been in progress upon these collections. The ease and rapidity with which the work has been carried on under the favorable conditions supplied at Wood's Holl, is a strong argument for the enlargement of the work-rooms assigned to the department of fishes in the Museum.

Duplicate specimens of fishes have been sent out to the following institutions and universities:

Prof. Fernando Ferrari-Perez, for the National Museum of Mexico. One hundred and one species of fishes from the West Indies and the Gulf of Mexico. Also, seven casts of fishes.

Army Medical Museum, Washington, D. C. Seven species of fishes in alcohol, sent by request of Dr. Billings.

Prof. O. P. Hay, Butler University, Irvington, Ind. A specimen of *Semotilus bullaris*.

Prof. W. B. Scott, Princeton College, Princeton, N. J. Two specimens of *Amia calva* and two of *Polyodon folium* for study.

F. L. Washburn, for the museum of Minneapolis, Minn. Seven species of marine fishes in exchange.

Prof. F. A. Smitt, for the Royal Museum of Natural History, Stockholm, Sweden. The following species of *Salmonidæ* in return for Swedish species: *Hypomesus pretiosus*, *Osmerus dentex*, *Thaleichthys pacificus*, *Mallotus villosus*, *Coregonus merki*, sub sp., *Salmo gairdneri*, *Salmo irideus*, *Salmo purpuratus*, *Salvelinus malma*, *Oncorhynchus chouicha*, *Oncorhynchus nerka*, *Oncorhynchus keta*, *Oncorhynchus kisutch*, *Oncorhynchus gorbuscha*.

The card catalogue of the collection of fishes has been brought up to date, as, also, the catalogue of drawings.

The wood cuts have been fully indexed as far as they were identified. The entire collection of fishes in jars and tanks has been gone over twice, the alcohol renewed, and fishes transferred from tanks to large jars whenever this was practicable. The deep-sea fishes studied at Wood's Holl were installed in study-rooms as conveniently as our limited space will permit, while vast numbers of duplicates have been placed in the basement.

During the year the curator has personally superintended the printing of Bulletins 23, 28, 29, 30, and 31, of the Museum, besides a volume of the Proceedings.

LIST OF FISHES DRAWN DURING THE YEAR ENDING JUNE 30, 1886.

July, 1885:

35636. *Cubiceps gracilis.* Lateral view.
38220. *Tyntlastes*, n. s. Lateral view.
37118. *Gerres zebra.* Lateral view.
37233. *Cyprinus carpio.* Lateral view (leather).

August, 1885:

27640. *Pleuronectes stellatus.*
32442. *Cottus decastrensis.*
31968. *Potamocottus gulosus.*
23936. *Artedius notospilotus.*
24007. *Liparis cyclopus.*
27982. *Microgadus proximus.*
27605. *Hippoglossus vulgaris.*
33834. *Murænoides ruberrimus.*
27546. *Liparis calliodon.*

September, 1885:

21718. *Stichæus punctatus.*
27514. *Oligocottus maculosus.*
Blake CCXXI. *Aphyonus mollis* (type).
Blake XVI. *Monolene atrimana* (type).
Blake CXIII. *Spinax pusillus.*
Blake LIV. *Telescops columbianus* (type).
37350. *Macrurid* n. g. (type).
37346. *Anthias aquilonaris* (type).
37345. *Chilomycterus.*

October, 1885:

Blake XCIII. *Neobythites robustus* (type).
Blake LXXIX. *Neobythites marginatus* (type).
37332. *Etropus rimosus* (type).
37349. *Limanda beanii* (type).
37348. *Aphoristia fasciata.*
37347. *Aphoristia diomedeana* (type).
28778. *Aphoristia pusilla* (type).
Hemirhombus fimbriatus (type).
Albatross Station, 2431. *Platysomatichthys hippoglossoides.*
Albatross Station, 2376. *Aphoristia marginata* (type).
Albatross Station, 2543. ? *Etropus*, young.

November, 1885:

Glyptocephalus cynoglossus, young.
Neobythites gillii (type).
Macrurus caribbæus (type).
Stomiatid.
Blake LXXX. *Bathygadus favosus* (type).
Peristedium longispatha (type).
Blake CLXXIII *Halosaurus pallidus* (type).
Thalassophryne maculosa.
Citharichthys monoceros (type).
37388. *Anthias*, n. s.
Ipnops murrayi.
Bregmaceros atlanticus (type)

December, 1885:

Blake XXX. *Bathypteros quadrifilis.*
Callionymus agassizii (type).
37386. *Cottunculus torvus.*
Raia.
Blake CCXLIV. *Citharichthys spilopterus.*
Notoscma dilecta.
Platophrys nebularis? juv.

January, 1886:

5985. *Diodon hystrix.*
5989. *Ostracion triqueter.*
Albatross Station, 2316. *Monacanthus ciliatus.*
29670. *Genypterus omostigma* (type).
37771. *Monocanthus.*
37772. *Priacanthus.*
37334. *Macrurus occa* (type).
Albatross Station, 2317. *Hemirhombus.*
37665. *Isurus dekayi.*
Blake CLXXIII. *Halosaurus pallidus* (type) bis.

February, 1886:

Blake CVII. *Scyllium boa.*
37782. *Salmo irideus.*
37801. *Argentina silus.*
17456. *Salvelinus alpinus.*

28599. *Salmo fario.*
20638. *Salvelinus oquassa.*
March, 1886:
Albatross Station, 2858. *Oreosoma* (?).
Blake LX. *Peristedium platycephalum* (type).
Albatross Station, 2316. *Malthe nasuta.*
37790. *Hexanchus griseus.*
April, 1886:
3785. *Notacanthus.*
37861. *Pteraclis carolinus.*
Blake XXIII. *Aphoristia pigra* (type).
37860. *Sudis.*
35637. *Paraliparis n. sp.* ((type).
May, 1886:
37886. *Torpedo.*
Blake LXXXI. *Uraleptus?*
Coregonus.
Salvelinus namaycush.
June, 1886:
38001. *Carcharinus glaucus.*
Coryphæna punctulata.
Ecl.
Albatross Station, 2663. *Synodontid.*
Exocœtus.
Exocœtus.
Albatross Station, 2642. *Maurolicus.*
Albatross Station, 2647. *Nomeus gronovii.*
Albatross Station, 2665. *Gonostoma.*
Albatross Station, 2679. *Coryphæna.*
Albatross Station, 2392.

The number of specimens now in the Museum is estimated to be about 75,000, divided as follows: (1) in the reserve series, 38,000; (2) on exhibition, 22,000; (3) duplicates, 15,000. Numerous additions to the duplicate series have been obtained from the deep-sea investigations of the U. S. Fish Commission.

The condition of the collection is constantly improving, and would be still more rapidly perfected by increasing the space for assorting and installing the vast amount of material now crowded into the basement of the Smithsonian Institution.

REPORT ON THE DEPARTMENT OF MOLLUSKS (INCLUDING CENOZOIC FOSSILS) IN THE U. S. NATIONAL MUSEUM, FOR THE YEAR ENDING JUNE 30, 1886.

By WM. H. DALL, *Honorary Curator.*

The character of the accessions to this department during the past year is, as usual, fairly enough indicated in the list of accessions,* and includes about 75 accession entries.

As usual, the collection is indebted to the U. S. Fish Commission and its officers for the largest *ensemble* of donations from a single source. The material received is all from south of Cape Hatteras, all that from north of this point being retained for study at New Haven, by Prof. A. E. Verrill. This collection, besides the common littoral shells brought back in quantity, contained a fair proportion of deep-water species, the study of which is of extraordinary interest.

Among the named species received during the year and which are of more than ordinary interest may be mentioned a selection of 71 species of shells from Bering Sea, illustrating a recent report by Dr. A. Krause of the expedition sent out by the Bremen Geographical Society; a small series of land and fresh-water shells from Manitoba, illustrating a paper by the donor, Mr. Robert Miller Christy, and a very fine series of Madagascar land-shells of remarkable character received from Edward Bartlett, esq.

From the arctic and boreal province we have received a valuable lot of dredgings by the U. S. revenue-cutter *Corwin*, Capt. M. A. Healy, U. S. Revenue Marine, from the Arctic Ocean near Bering Strait, and a small but interesting series from the Commander Islands, from the Governor Nikolai Grebnitzki, of the Russian service.

From the subtropical region Mr. Charles T. Simpson has contributed a valuable and interesting series of shallow-water species from South Florida and the Keys as well as the coast of Honduras. Prof. A. G. Wetherby has also sent some very interesting species from the coast of northwestern Florida.

Prof. J. H. Morrison has sent from the grounds of the Virginia Military Institute, Lexington, Va., a series of *Helix hortensis* Linné, inter-

*Part v.

esting as being a totally new locality for this attractive imported species.

Among fossils, James Shepard, esq., has contributed a box of very beautiful silicified shells from the well-known deposit, described by Conrad many years ago, on the Hillsboro' Bay arm of Tampa Bay, West Florida.

On the whole the accessions of the year, while not including any collection of extraordinary size, have brought to the department of Mollusks a full share of valuable and interesting material, more than in many previous years, if not so much as in a few exceptional seasons, and, as usual, more than the present force could deal with while still hard at work on the arrears of previous seasons.

The routine work of the department consists in the unpacking, cleaning, assorting, classifying, labeling, registering, putting on exhibition or in its proper place in the study series, of each lot of new material which comes in; besides eliminating duplicates and packing them in such shape as to be conveniently accessible when needed for distribution.

Specimens which have been studied or named before being received have part of the above work already done, but in general the above is required for each lot or a series from each lot of specimens. The smaller species are put in vials, corked, to save them from dust or injury, together with a slip bearing the registration number, which also appears upon the label, or if the shell is large enough and has a proper surface is indelibly written on the specimen itself. Fossils generally require to be treated with a solution of shellac before they will bear marking, but the old and objectionable method of mounting specimens on tablets has, for the study collection of the U. S. National Museum, been definitely abandoned. It will be noted, therefore, that each specimen or lot of specimens which are entered under one registration number (and always comprising but one species or variety from one locality) undergoes seven or eight different bits of treatment, and requires, before it is put aside, a tray, a label, a number, a corked vial (or a number written on), and a line in the registration book. In the ideal condition of the collection to be attained hereafter, each lot will also have its place on a card which will form one of a series or card catalogue, embracing all the specimens which are or at any time have been in the Museum, and recording the data relating to them. This, however, in the present state of the force, can only be anticipated, at least for departments including such a vast quantity of material as is embraced under the general head of Mollusks.

Besides the routine work on the recent and fossil shells which appear in the form of donations or exchanges, or arrears of past years, which are still formidable, there is the administrative work of the department. This includes its relation to the Museum as a whole, and to the objects of the Museum as exemplified in the use of the material in its possession.

The mere piling up or accumulation of named, labeled, and classified shells is, of itself, of value only to the person who goes through with the mental and physical exertion it requires. To justify the existence of a public museum it is generally admitted it must do more than this.

In the Department of Mollusks the following objects are steadily kept in view, and the progress made is directly or indirectly instrumental toward the attainment of them:

(1) The preservation of types which have served for previous study as a means of verifying the accuracy of past work or the proper orientation of new researches.

(2) The full representation of American forms in the study collection; not only that the fauna of our own country may be fully known but for ease in assisting American students to recognize the forms of their local collections, and for the benefit of the foreign student, who may thus make his comparisons or researches in one place with the least expenditure of time, travel, and expense.

Under the two previous heads the Binney collection of North American land shells has been arranged in a special case, numbered and arranged to correspond with the last publication on the subject by Mr. Binney.

Considerable progress has been made with the other American land shells, and the present year will certainly see our collections of this sort in complete order for ready reference by the naturalist or paleontologist.

(3) The instruction and entertainment of the public, who, drawn by curiosity or the love of beautiful and unusual objects, come to view the contents of the Museum which are on exhibition.

The curator has been convinced by past experience that to be useful to the general public a collection of biologic material should not be too large, should be arranged on as simple a plan as can be devised, and should have as many and as large legible labels as is consistent with the proper visibility of the objects in the case.

If the cases for exhibition can be so filled and arranged as to teach a lesson which he who *runs* may read, it is my opinion that they come near doing their best possible work for the average visitor.

In this view the cases devoted to the shell exhibit are for the passer by and not for the student, unless a beginner. One case arranged by the curator has been devoted to the chief types of Cephalopods, to pearls and pearl formations, cameo shell and sections showing the internal structure of various large and ornamental species. The sections of the recent and the fossil Nautiloids are put side by side. Specimens of the *Spirula*, *Loligo*, *Sepia*, etc., in alcohol fully labeled, alternate with stands on which are mounted the shelly parts of the same genus.

The various shells which produce pearls stand by the side of the pearl itself mounted in a vertical tube with a hemispherical end,

under which, on a blackened surface, the pearl reposes in safety from dust or loss, while the base is large enough to display a proper label.

A specimen pair of *Tridacna gigas*, weighing 305 pounds, has been mounted as an exemplar of the largest known mollusk of recent seas.

Under the careful supervision of Dr. Stearns various cases, containing selections of edible or economic mollusks from the Atlantic and Pacific, of ornamental species from tropical seas, of the ordinary species of our Atlantic beaches familiar to sojourners at watering places on the sea-shore, and of the land and fresh water species from our lakes and streams, have been put on exhibition, with proper labels, which, however, had in some cases to be written, since the printed series have been delayed and it was not thought well to wait for them.

The series for which exhibition cases are at present available will, without doubt, be completely arranged early in the course of the present year.

Fair progress has been made in the determination of the mollusks of the southeastern coast of the United States and adjacent waters, for which only at the present time have we begun to possess material which should make a thorough illustration of this area possible.

Another element of the routine work which enters largely into the exertions required of the curator and his assistants is that of furnishing specialists or students with names, information, objects having an important bearing on investigations in progress, or special collections for school or class purposes. This work is constant, and the correspondence relating to it averages a page a day during the working days of the year. The curator has endeavored to assist not merely those who had by contributions to the Museum or their scientific standing an official claim upon his attention, or those to whose needs his attention had been formally called by the Museum authorities, but also all who have applied, whether considerate in their requests or otherwise, as sometimes happens. The character of this work can be judged by a reference to the list of egressions in the Appendix.

Besides these matters, the curator's official duties as the Paleontologist in charge of the Division of Cenozoic Paleontology for the U. S. Geological Survey (by favor of whose Director, Maj. J. W. Powell, he has been permitted to embrace both fields of labor in his daily occupation), have, of course, precedence, and imperative claims upon his time for determination of specimens, and reports, monthly, annual, or occasional, as well as other things. These being taken into consideration with the character and amount of the routine work as above briefly sketched, it will, in the opinion of the curator, appear that the results in the shape of work, statistically stated elsewhere in this report, are fully abreast of the opportunities offered by the situation.

A list of the papers published by the curator and others, and bearing directly or indirectly upon the work of this department, will be found in Part IV.

The manual of North American land shells, by Mr. W. G. Binney,* is based in large part upon a collection named and presented by him, which has been arranged in accordance with the manual and placed in a special case for immediate reference at any time by those interested.

The bibliography of the writings of the venerable Nestor of conchology in the United States, Dr. Isaac Lea,† is also noticed in the Museum bibliography. The types of the species, with few exceptions, are contained in the National Collection, which has been enriched from time to time from Dr. Lea's unrivaled cabinet.

LIST OF EGRESSIONS.

Services have been rendered and material sent out by the department of mollusks and cenozoic invertebrate palæontology, as follows: (1) For educational purposes, to teachers, to isolated students, etc.; (2) in return or exchange for material received for the Museum from collectors; (3) for the promotion of science by enabling special students to compare and study forms otherwise inaccessible to them.

Agassiz, Prof. Alexander, Cambridge, Mass. Deep-sea Pelecypod mollusks (about 250 species and a much larger number of specimens), dredged by the U. S. steamer *Blake*, under the direction of Professor Agassiz; determined, classified, and described. This work, concluded with the current year, has in reality occupied much of the curator's leisure for the last seven years, and the results are believed to be important for science.

Boyce, S. E., Santa Barbara, Cal. Forty-seven specimens, 21 species, sent in return for economic mollusks received by the Museum. (June 10, 1886.)

Bryan, O. N., Marshall Hall, Md. About 150 specimens, 50 species of shells, furnished in exchange. (October 10, 1885.)

Greely, Lieut. Adolphus W., U. S. Army. A number of specimens and drawings made or collected at Lady Franklin Bay; identified as far as practicable. (April 1, 1886.)

Haddon, Prof. A. C., Royal College of Sciences, Dublin, Ireland. Chitons (20 specimens, 14 species) furnished for study. (July 9, 1885.)

Hemphill, Henry, San Diego, Cal. Names of shells furnished on various occasions, also shells (12 specimens, 6 species) in exchange. (July 9, 1885.)

Hittell, J., Allentown, Pa. Shell of Teredo, for study. (November 26, 1885.)

Jackson, Rev. Sheldon, Washington, D. C. Information furnished. (February 3, 1886.)

Knott, W. T., Lebanon, Ky. Shells (105 specimens, 44 species) sent in return for contributions to the Museum. (October 20, 1885.)

Lehnert, Rev. E., Washington, D. C. Florida shells, named in response to personal application. (December 19, 1885.)

Lockley, Miss Louise, Butte, Mont. Shells (160 specimens, 83 species), as educational series. (February 12, 1886.)

McMurrich, Prof. J. Playfair, Johns Hopkins University, Baltimore, Md. Information furnished on written application. (January 7, 1886.)

Mazyck, W. G., Charleston, S. C. Shells named. (January 21, 1886.) Information furnished. (May 10, 1886.)

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* Bulletin 28, U. S. National Museum.

† Bulletin 23, U. S. National Museum, prepared by Newton P. Scudder.

Musée Royale d'Histoire Naturelle, Bruxelles, Belgium. Pteropods and copies of water-color drawings, from life, of Pacific Pteropods, furnished for use in special investigations in progress by Dr. Paul Pelseneer of that museum. (April 2, 1886.)

Newlon, Dr. W. S., Oswego, Kansas: Fresh-water shells (6 lots), named and reported on at different times.

Orcutt, C. R., San Diego, Cal. Shells named. (January 4, 1886.) Shells (62 specimens, 116 species) sent in return for material received by the Museum. (June 10, 1886.)

Pelseneer, Dr. Paul, Bruxelles, Belgium. Information furnished. (April 1, 1886, May 29, and June 22, 1886.)

Rounds, S. P., Washington, D. C. Shells (197 specimens, 52 species), furnished for educational purposes. (November 2, 1885.)

Rush, Dr. W. H., U. S. Navy, U. S. Steamer Blake. Antillean shells (about 150 species), named in return for services rendered the Museum. (December 17, 18, 1885.)

Smith, Edgar A., British Museum, London, England. An *Amusium*, sent for study. (April 30, 1886.)

Taylor, Dr. L. M., Washington, D. C. An *Octopus rugosus*, identified. (November, 1885.)

Tryon, G. W., jr., Philadelphia Academy of Natural Sciences, Philadelphia, Pa. Information furnished. (January 26, 1886.) An *Operculum*, donated for purposes of study. (December 5, 1885.)

Walker, Chas. W., Lawrence, Mass. Information furnished. (May 31, 1886.)

Wetherby, Prof. A. G., Cincinnati, Ohio. Information furnished. (January 30, 1886.)

Whiteaves, J. F., Paleontologist, Dominion Geological Survey, Ottawa, Canada. Information furnished and specimens identified. (March 29, April 24, June 6, and June 9, 1886.)

LIST OF ENTRIES IN REGISTER OF MOLLUSKS.

Entries.		Number.
2138 to	2151.....	13
9404	9526.....	122
12258	12501.....	243
27625	27671.....	46
28070	28080.....	10
33676	33751.....	75
34630	34651.....	21
37503	38750.....	1,247
38751	39901.....	1,150
40522	40902.....	380
41426	41675.....	249
43651	46150.....	2,499
48551	49050.....	499
50226	51200.....	974
52000	52239.....	239
52888	53207.....	319
53451	58350.....	4,899
58351	63250.....	4,899
63251	64005.....	754
Total.....		18,638

NOTE.—At an average of three specimens to an entry this would indicate between 50,000 and 60,000 specimens finally administered upon in 1885–'86.

CONDITION OF THE COLLECTION OF MOLLUSKS.

As stated in previous reports the total number of specimens in the collection can only be estimated. Not including the material in the hands of Professor Verrill and assistants, but including duplicates and alcoholic specimens, the total last year must have been in the vicinity of 400,000. The number received during the year has not been counted, as much of it still remains in the original packages. Not until our arrearages are closed up shall we be able to state categorically the annual numerical changes in a collection comprising so many minute objects, of which there may be hundreds in a single box or bottle.

The number of entries in the Museum register of mollusks, including quaternary fossils, from July 1, 1885, to June 30, 1886, inclusive, was 18,638, representing between 50,000 and 60,000 individual specimens. During the twenty years or more which have passed over the collection since I first made acquaintance with it up to July 1, 1885, the total number of entries has been 42,440; or much less than three times as many as have been attended to in the single year just closed.

During the past year we have closed up all vacancies in the catalogue arising from whatever causes, except those where numbers have been reserved for Professor Verrill for use in connection with the Fish Commission collection temporarily at New Haven. In future, therefore, the schedule of entries given in the appendix to this report will probably be much less complicated. The last number actually used in 1886 was 64005, but the full schedule is comprised in Appendix C.

As explained above and in previous reports a categorical enumeration of the material, reserve and duplicate, in the custody of this department is at present impracticable, and even an estimate must necessarily be of a very approximate nature.

The need of intelligent clerical assistance in this department is greater than ever since the disablement of our most efficient clerk by illness, the termination of which can not yet be predicted.

REPORT ON THE DEPARTMENT OF INSECTS IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By C. V. RILEY, *Honorary Curator.*

Beyond the mere preservation of accessions and proper attention to correspondence little original Museum work has been attempted, as the curator's services are voluntary, and the only assistance furnished was the temporary employment for a few months of Mr. Albert Koebele. Much was, however, done, indirectly, through the Entomological Division of the Department of Agriculture, as more or less pure Museum work is consectaneous with that of said division.

In August, 1885, Mr. J. B. Smith, of Brooklyn, N. Y., already favorably known by his writings on Lepidoptera and Coleoptera and by his activity as a member of the Brooklyn Entomological Society, was, upon my recommendation, appointed as assistant, and with this appointment assured I formally donated my private collections to the Museum.

THE RILEY DONATION.

This is mentioned among the accessions as No. 16738, and as the circumstances connected with the donation will probably be alluded to in the report of the Assistant Director, I give in this connection merely a general statement of its contents and condition, as follows:

PINNED MATERIAL.

	Boxes.	Specimens.	Species.
Hymenoptera	66	24,796	2,650
Coleoptera	127	43,613	6,558
Lepidoptera	338	17,098	2,308
Diptera	21	5,646	699
Hemiptera	59	8,862	1,184
Orthoptera	64	6,903	560
Neuroptera	14	868	169
Arachnida and Myripoda	2	425	110
Insect architecture	16	1,080	178
Miscellaneous (not yet arranged)	28	1,610	178
Galls and gall insects	31	4,152	734
Total, pinned	766	115,053	15,328

In addition to these pinned specimens, the collection contains some nineteen large boxes of alcoholic material, chiefly of the adolescent states of insects, comprising some 2,850 vials, in many cases several species being contained in a single vial. The early states of the minuter insects are mounted in balsam on slides (1 by 3 inches), of which the collection contains upward of 3,000, most of the slides holding the contents of three cover glasses. The collection contains a large number of undescribed species in all orders.

The mounted material is contained for the most part in double-folding boxes, about 32 by 22 by 8 centimeters, made into book form and carefully lined on both sides with cork and covered with paper. A certain proportion of the boxes are less than 7 centimeters wide and are lined only on one side. There are also two cabinets, one with sixteen large glass-covered drawers, and another (still at my residence for want of room) of sixty glass-covered drawers. The specimens are all duly classified and labeled, and in excellent order and preservation. The labels include notes as to locality and food habit, and are also in many cases numbered to correspond to detailed notes as to adolescent states and habits. The collection was begun twenty-five years ago, and represents my continuous collectings since, including my own types and many of other authors received in exchange. It embraces few exotic species, and is more particularly rich in biological material, containing more blown and alcoholic larvæ and pupæ in connection with their imagos than perhaps any other collection of North American insects. Including the unarranged and alcoholic material not connected with the pinned specimens, there are over 20,000 species in the collection.

With this new departure and the permanent establishment of the department it may not be inappropriate to state what should be the aims and objects of such a department, or at least what I conceive they should be and shall strive for. Collections of objects intelligently brought together are necessarily educational in influence; but a national collection of insects, on account of the very great number of species and the exceeding minuteness and the fragility of the great majority of the species, as compared with other animals, must needs have a dual character, and should consist of (1) the cabinet or study collection proper and (2) the exhibit collection.

The ideal *cabinet* collection of a National Museum should represent, as completely as possible, the insect fauna of the country, properly classified and determined. It can, necessarily, have little interest for the public at large and should be consecrated to the use of the specialist and to the advancement of the science of entomology. For this purpose it should be most carefully guarded and conserved in the best-made drawers and cases and secured alike from light and the too constant handling of the mere curious. It should constitute a study collection to which workers are drawn for unpublished facts and for comparisons and determinations. It should be so well conserved and

provided for as to induce describers of new species to add to it their types or authentic duplicates thereof. It will be many years ere such an ideal collection can be gotten together, and none now living may witness it, but the material now on hand forms a good foundation for it.

The *exhibit* collection should be something entirely independent and apart from the other, and, on account of the rapid deterioration of insect specimens constantly on exhibition and necessarily much exposed to light, should consist, as far as possible, of duplicates only, or of such commoner species as can be easily replaced. Intended for the instruction and edification of the lay visitor to the Museum, it should illustrate in the boldest possible way the salient characters of the class, the larger classifactory divisions and the structures on which they are based, the wonderful metamorphoses and economies of the commoner and easily recognized species and particularly in their relations to man either directly or indirectly through injury or benefit.

The value of such an exhibit collection depends very much on conspicuity, and this can best be obtained by the liberal use of diagrams and enlarged drawings, as the majority of the most interesting species and those which most concern men are almost microscopic in size. Such an exhibit collection will miss its mark and object whenever it exceeds these limits, and by too much detail seeks to interest and instruct the specialist or in other ways trenches on the function of the study collection. As the Museum, in this department, will, in accordance with statute (Revised Statutes, sec. 5586), receive a great deal of its best material through the Department of Agriculture, one of the chief aims of this national collection should be to reciprocate, not only by preserving all systematic material and thus aiding said Department of Agriculture in necessary determinations, but by giving particular attention to the biological side of the collection. This I have endeavored to do, and the collections illustrating the biology of North American insects are probably the largest in the world.

The character of the drawers and cabinets employed in such a national collection is important; for upon it the future preservation of specimens very greatly depends. Knowing it to be Professor Goode's desire to adapt, as far as possible, the drawers used in all departments to the unit size which he has adopted for the Museum, some effort was made in this direction, but the adaptation, while possible for the exhibit collection, was found impracticable, or at least very undesirable, for the study collection. Hence, after carefully studying, in person, the different forms and patterns used for entomological collections both in this country and Europe, as well as by private individuals and public institutions, we have adopted a drawer and cabinet essentially after the pattern of those used in the British (South Kensington) Museum, best adapted in size to our own requirements or conception. The drawers are square, with an outside measurement of 18 inches and an outside depth of 3 inches. The sides and back have a thickness of three-eighths of an

inch, while the front is five-eighths of an inch thick. The pieces are firmly dove-tailed together, the front being clean and the dove-tailing blind. The bottom is of three-ply cross-grained veneer, run into a groove at the sides, leaving a clear inside depth of $2\frac{1}{16}$ inches to the frame of the cover. The bottoms are lined in all but forty of the drawers with first quality cork one-fourth of an inch thick. At a distance of one-fourth of an inch from the sides and back and three-eighths of an inch from the front there is an inside box of one-eighth inch whitewood closely fitted, and held in place by blocks between it and the outer box. There is thus between the inner and outer box a clear space all round, in which insecticides or disinfectants can be placed to keep out Museum pests, making it impossible for such to get into the inner box containing the specimens without first passing through this poisonous chamber. The entire inside is lined with white paper, or, in the case of the uncorked boxes, painted with zinc-white. The front is furnished with a plain knob. The cover is of glass, set into a frame three-fourths of an inch wide, three-eighths of an inch thick, with a one-fourth-inch tongue fitting closely into the space between the inner lining and outer box, which here serves as a groove. This arrangement secures a perfectly tight box of convenient size, and not unwieldy for handling when studying the collection.

The material of which these boxes are made is California redwood, except the cover frame, which is mahogany. The cabinets containing these drawers are 36 inches high, 40 inches wide, 21 inches deep (all outside measurements), and are closed by two paneled doors. Each cabinet contains twenty drawers in two rows of ten each, the drawers running on hard-wood tongues which fit into grooves on the side of the box. These cabinets are also of redwood. In the selection of redwood as material for the drawers and cabinets the Curator was influenced by a desire to secure a handsome piece of furniture at a moderate cost, and if carefully finished they would have answered expectations. As, however, it was necessary under the present laws to give the work to the lowest bidder, the contract for making them was awarded to one who furnished a set of cabinets which were barely within the specifications. The work is machine finished, carelessly put together, and evidently run through with little regard for anything save to come within the absolute terms of the specifications.

The cabinets therefore, while very satisfactory, convenient, and safe, do not present the neat and tasty appearance and careful finish that they would have had if they had been made by a careful and skilled mechanic. In future we intend to use cherry for the cabinets and mahogany for the drawers. These woods, while more expensive, are much more durable, and in all respects preferable.

The bulk of the collection is still contained in small folding boxes which are admirably suited for containing a working collection, espe-

cially of those orders comprising smaller insects like Coleoptera, Hymenoptera, etc. These folding boxes have the great advantage of being readily re-arranged upon shelves and of being very easily used in study.

The folding boxes finally adopted are of white pine, shellacked, and varnished, the bottom and top double, and cross-grained to prevent warping. They are 13 by 8¼ inches outside measurement, the top and bottom projecting slightly at the front and sides. The inside measurement is 11¾ by 7. The sides, back, and front are five-sixteenths of an inch thick, with a machine joint, which is neat and very secure. The boxes are 2⅝ inches in outside depth, unequally divided, the lower portion 1½ inches outside depth, lined inside with a thin whitewood lining, projecting three-fourths of an inch above the rim of the outside box. Over this projecting lining the cover part of the box closes and makes thus a dust and museum pest-tight box. The bottom is cork-lined and covered with a fine white glazed paper.

All the boxes are furnished with neat brass label holders into which a card containing a list of the contents can be readily placed and removed at pleasure. The two parts of the box are hinged together and held closed by two small brass hooks closing over a neat brass screw. Similar boxes have been used by a number of collectors and given some satisfaction. The good features of all are, we believe, united in this box, the workmanship of which also leaves little to be desired.

The biological material is, very much of it, alcoholic, for though many of the immature states of insects may be preserved by dry processes yet the bulk must needs be kept in alcohol. Where the material is in duplicate it is well, when it is not too heavy or cumbersome, to place such biological material with the systematic collection, yet experience has taught me that it is wiser to make a separate *biological collection*, and this it is proposed to do. This collection will in fact be a feature of the Museum collection in the future. Hence it was very desirable to adopt some method of securing the vials in such a manner that they can be easily moved from one place to another, and fastened in the ordinary boxes and drawers employed for pinned insects. The vials in use to preserve such specimens as must be left in alcohol or other liquids are straight glass tubes of varying diameters and lengths with round bottom and smooth, even mouth. The stopples in use are of rubber, which, when tightly put into the vial, the air being nearly all expelled, keep the contents of the vial intact and safe for years.

Various forms of bottles are used in museums for the preservation of minute alcoholic material. I have tried the flattened and the square and have studied various other forms of these vials; but I am satisfied that those just described, which are in use by Dr. Hagen in the Cambridge Museum, are, all things considered, the most convenient and economical. A more difficult problem to solve was a convenient and satisfac-

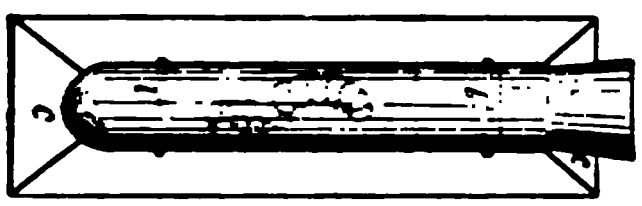
tory method of holding these vials and of fastening them into drawers or cases held at all angles, from perpendicular to horizontal. Most alcoholic collections are simply kept standing, either in tubes with broad bases or in tubes held in wooden or other receptacles; but for a biological collection of insects something that could be used in connection with the pinned specimens and that could be easily removed from place to place was desirable. After trying many different contrivances I finally prepared a block, with Mr. Hawley's assistance, which answers every purpose of simplicity, neatness, security, and convenience. It is, so far as I know, unique, and will be of advantage for the same purpose to other museums. Hence I have concluded in this report to give a brief description of it. It has been in use now for the past three years, and in every way has been of great help and satisfaction in the arrangement and preservation of the alcoholic specimens.

The blocks are oblong, one-fourth of an inch thick, the ends (*c c*, fig. 1) beveled, the sides straight. They vary of course in length and breadth, according to the different sizes of the vials, and are painted white. Upon the upper side of these blocks are fastened two curved clamps of spring wire (*b b*, fig. 2), forming about two-thirds of a complete circle. The fastening to the block is simple and secure. The wire is first bent into a loop as shown in figure, a brad-awl is used to make a slot in the block into which this loop is forced (*e*, fig. 3), a drop of warm water being first put into the slot to soften the wood which swells and closes so firmly around the wire that it requires considerable force to pull it out. Four pointed wire nails (*d d d d*, fig. 4) set into the bottom so as to project about one-fourth an inch serve to hold the block to the cork bottom of the case or drawer in which it is desirable to place it. The method of use is simple and readily seen from the corresponding figures which represent the block from all sides.

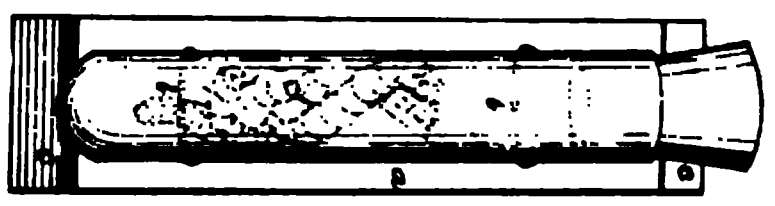
The advantages of the block are the ease and security with which it can be placed into or removed from a box, the ease with which a vial can be slipped into or removed from the wire clamps, the security with which it is held, and the fact that practically no part of the contents of the vial is obscured by the holder—the whole being visible from above.

The beveled ends of the block may be used for labeling, or pieces of clean card-board cut so as to project somewhat on all sides may be used for this purpose and will be held secure by the pins between the block and the cork of the drawers.

Our routine work has consisted of (1) acknowledgment and preservation of the accessions, (2) the departmental correspondence, (3) the determination of material sent in for naming, (4) exchanges, (5) utilization of old alcoholic material, (6) work on the exhibit collection, (7) work on the study collection, (8) proper supervision and preservation of all collections, and may be more fully considered under these several heads.



1



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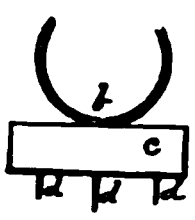

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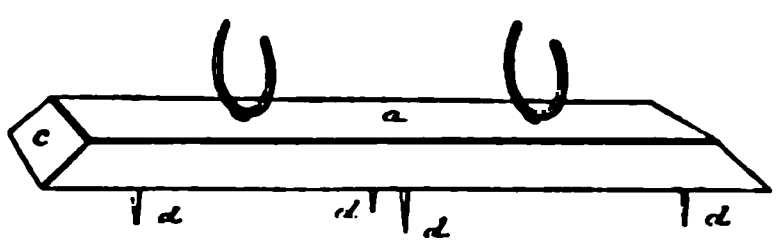

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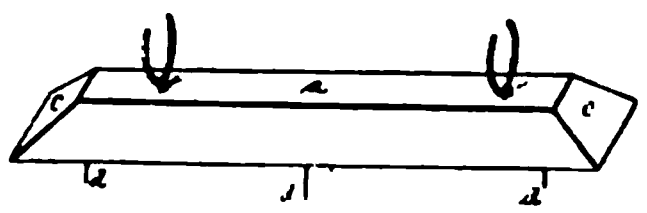

5

VIAL-HOLDER DESIGNED BY C. V. RILEY, AND IN USE IN THE DEPARTMENT OF INSECTS.

a, the block; *b*, spring wire clamps; *c*, beveled ends of block; *d*, pointed wire nails. (Lettering on all figures the same.)

The following list comprises a few of the most important accessions of the year :*

16364. A large lot of miscellaneous insects from Dr. R. W. Shufeldt, Fort Wingate, N. Mex.; received September 3 and 5, 1885. This lot of insects contained a very large number of specimens of all orders, embracing just such species as a superficial collection would make in that locality. The insects were all mounted and determined, at considerable expenditure of time and labor, and a tolerably complete list of the material was sent to Dr. Shufeldt. It contained a few species of value to the Museum, but more of them were duplicates, and some of them, owing to their being preserved in alcohol, were useless.

16408. Mixed insects (13 vials) from Panama, from Drs. George W. and Wolfred Nelson, 346 and 348 Broadway, New York; received September 7, 1885. Most of these were the common Central American forms, but the specimens were mostly good and useful as exhibit material.

16401. A large lot of Coleoptera (unmounted), from Prof. A. Dugès, Guanajuato, Mexico; received September 11, 1885. This collection was all mounted and arranged and partly determined. There were many species and considerably more than 1,500 specimens. Some of these insects have been used in the exhibition collection and others are held as the nucleus to a collection of Mexican Coleoptera.

16558. Several specimens of the larvæ of *Eristalis tenax*, from Dr. O. R. Early, Kentucky street, Columbus, Ky., said to have been taken from the bowels of a female patient. A letter was written to Dr. Early asking further details and evidence as to the fact of this locality for the larva, but no reply was ever obtained. Whether the doctor found his original statement based upon a misapprehension or whether professional duties prevented can not be discovered.

16626. Bot-fly larva of the genus *Cuterebra*, from the neck of a lady, presented by Miss Lavinia C. Dundore, Washington, D. C. A most interesting accession and contribution to the subject of parasites upon man. Its parasitism upon the human species is doubtless accidental, and at the same time the circumstances of the case itself are so interesting that we shall refer to them again at greater length at some future time.

16738. Collection of about 800 boxes, containing 118,000 specimens of 20,000 species of insects from various localities, from Prof. C. V. Riley, Washington, D. C. The regular accession card of this collection was received November 3, 1885, but the collection had practically been in the possession of the Museum long previously. Under this accession is included our donation to the Museum, referred to at greater length in another portion of the report.

17077. Exotic Lepidoptera (95), mostly duplicates, from Europe, spread and in good condition, from John B. Smith, the assistant curator; received January 13, 1886.

17078. Exotic Lepidoptera (43 specimens, 31 species), mostly from Africa and India, spread and in good condition, from B. Neumoegon, box 2581, New York City. These specimens were obtained by the assistant curator during a brief visit to New York City, where he also determined many of the exotic Lepidoptera which were unnamed in the Museum collection.

16345. Alcoholic insects (3 vials), from Wytheville, Va.; received January 13, 1886.

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* In Part v, List of Accessions, mention is made of all the material received by the Department during the year. In this place, therefore, it is unnecessary to do more than refer to the more important accessions.

16400. Alcoholic insects (1 vial), from Wytheville, Va.; received February 1, 1886. The three last-mentioned accessions are from Col. M. McDonald, U. S. Fish Commission, and consist mostly of aquatic insects, largely neuropterous larvæ. All were duly determined and preserved, and a list furnished Colone. McDonald.

17139. Mexican insects, a large collection of Coleoptera, Hemiptera, and Lepidoptera, from J. Farrari Perez, naturalist of the Mexican Geographical and Exploring Commission. This is an important accession, containing more than a thousand specimens of the three orders, all mounted and many of them named. In conjunction with the insects sent by Professor Dugès there is quite a fair collection of Mexican Coleoptera.

17221. U. S. Diurnal Lepidoptera, comprising many of the rarer species needed in the collection, and a collection of European Coleoptera, from J. B. Smith, the assistant curator. The European Coleoptera were brought in for the exhibition collection, and are sufficient in number to give a fair idea of the European fauna.

17245. Lepidoptera (3 boxes), mostly micros., and mostly from Texas, from A. Bolter, 172 Van Buren street, Chicago, Ill.; received March 19, 1886. One box contained larger, named species, some of them rather rare, while the two others contained micros., unspread and undetermined.

17556. *Belostoma americanum*, from W. S. Primrose, Raleigh, N. C.; received April 3, 1886. During the latter part of March *Belostoma americanum* appeared in unusually large numbers, and flying in great quantities to the electric lights, were observed by many different persons and in many instances sent to the department.

17583. *Amnesia granicollis* (6 specimens), from R. D. Nevins, Olympia, Wash.; received May 12, 1886. This insect is said to injure fruit trees by gnawing off buds, but no details are given. It is the first appearance of this species as an injurious insect.

17628. *Lucanus elaphus* (1), from Mrs. Richard Carter, Cloverport, Ky.; received June 12, 1886. This specimen, it was alleged, was taken from the foot-board of a bee-hive, where it had posted itself before the opening and was capturing the bees as they came out! This habit is so at variance with the known habits of this species that confirmation is needed of the facts stated by our correspondent.

There were altogether 103 accessions during the year, which came to the department in the ordinary course, a large proportion useless for any purpose. In addition to these numbered accessions, many specimens have been added through the curator and the assistant, and several important collections have been added through the Department of Agriculture. First among these latter is the collection of Lepidoptera, purchased from Mr. O. Meske, of Albany, N. Y. This collection contains many types and typical specimens of American insects, and some years ago ranked as one of the finest in the United States.

There are fully 700 species and over 2,000 specimens contained in forty-five glass-covered drawers and boxes, and as a whole in very good condition. It contains a fair collection of European species also, obtained in exchange from some of the leading lepidopterists of Germany. There was also purchased by the department for the Museum the collection of the late H. K. Morrison, of Morganton, N. C., containing a few Lepidoptera, Diptera, and Neuroptera, and a very large lot of Cole-

optera—many hundreds of species and many thousands of specimens, contained in fifty-six large double boxes and forty-five cigar boxes. This collection contains a considerable number of species not in the other Museum collection, and an abundance of duplicate material valuable for exchange.

Mr. A. Koebele, collecting for the department in California, has sent in thousands of insects of all orders very carefully mounted and containing a large number of new species.

The correspondence has been, for the most part, confined to the necessities of the routine work, but has necessarily increased with the new impetus given to the department.

A number of insects have been received for determination and study, and the following list of determinations furnished, whether through the ordinary routine or by direct sendings to the curator or the assistant, will show the work in this direction:

September 29, 1885. Insects of all orders (several thousand specimens, about 300 species), mounted and determined for Dr. R. W. Shufeldt, Fort Wingate, N. Mex.

October 23, 1885. Lepidoptera (30 species), for Mr. H. L. Clark, Providence, R. I.

November 16, 1885. Noctuidæ (8 species), for Mr. Hy. Edwards, New York City.

December 18, 1885, Coleoptera (63 species), for W. H. Harrison, post-office department, Ottawa, Ontario.

December 10, 1885. Lepidoptera (42 species), for W. N. Tallant, 73 Jefferson avenue, Columbus, Ohio.

During the months of December and January the naturalists of the Mexican Exploring Commission had their collection of insects in the rooms of the department, and all facilities for the determination and classification of their material that the collections offered were afforded them in return for their generous gift to the Museum. A synonymical list of ninety species of Lepidoptera with bibliographical references was prepared by Mr. Smith and handed Senor Aguillero for incorporation in his report on the collections.

January 30, 1886. Coleoptera (51 species), for Mr. W. W. Hill, Albany, N. Y.

February 3, 1886. Lepidoptera (29 species), for Mr. Howard L. Clark, Providence, R. I.

February 12, 1886. Diptera, Hemiptera, and Hymenoptera (insects, 167 species), for F. W. Klages, Pittsburgh, Pa.

March 8, 1886. Lepidoptera (27 species), for Dr. C. S. McKnight, Saranac Lake, N. Y.

March 16, 1886. Insects (38 species and many specimens of all orders), for Col. M. McDonald, U. S. Fish Commission.

April 29, 1886. Small series of Pyralidæ, compared with Museum material for Dr. George D. Hulst, Brooklyn, N. Y.

June 2, 1886. Coleoptera (25 species), named for George F. Curtiss, Boston, Mass.

June 30, 1886. Coleoptera (16 species), for Charles W. Leng, New York City.

June 30, 1886. Lepidoptera (38 species), for William H. Ashmead, Jacksonville, Fla.

No attempt has yet been made to carry on a definite system of exchanges, as this can only be done to advantage when once the study collection in any order, or more limited group, has been fully rearranged, when our own desiderata and the duplicates we have to spare in exchange can be fully ascertained. A great deal of good duplicate and exchange material has already been separated, and I hope to make use of it in the near future.

Prior to the time when I was placed in charge of the department a very large amount of alcoholic material of all kinds had accumulated, some of it ten, fifteen, or twenty years old. Much of it had been soaking, unprofitably, in the Department of Agriculture, but a good deal was from time to time discovered in the basement of the Smithsonian. The examination of this material and the mounting and preservation of the useful or well preserved specimens required fully three months of steady labor, resulting in a weeding out of useless and cumbersome material, and an arrangement or classification of that part of the material which for any reason it was deemed advisable to preserve. Some of this material was labeled with accession numbers which, so far as could be ascertained, bore no relation to the present system of accession records, and were consequently of little value. A list has, however, been kept of all material thrown away. It consists chiefly of the larger Myriapods and Arachnids many times multiplied and unfit for use. The discovery that among this old material there were some typical specimens of scorpions led to a close examination of this part of the collection, and a fine series of scorpions has been selected and arranged. There are still many undetermined specimens, and it is probable that new species will be found among them. Dr. George Marx has promised to study and report upon them.

The principal routine work of the year has been on the exhibit collection. The material from the New Orleans exposition which, as stated in my last year's report, had arrived in fairly good condition, has been put in place, as also the exhibit of forest tree insects which I prepared for the International Forestry Exhibit at Edinburgh in 1884. The additional work done on this exhibit collection is indicated in the collections. The most noteworthy are the cases illustrative of the general classification of Arthropods and those devoted to a more full exposition of the classification of the order Lepidoptera. A series of fifty-six framed pictures representing various kinds of machinery or preparations for destroying insects was prepared and placed on exhibition, and a further series of thirty pictures, representing methods of

silk culture in Japan, received from Mr. Hitchcock, was also placed on exhibition.

The exhibit collection was opened to the public in April last.

On account of his familiarity with the Macro-Lepidoptera I have had the assistant devote most of his time, not otherwise occupied, to the arrangement of these insects in the permanent drawers, the progress being indicated in the statement of condition. As Entomologist of the Department of Agriculture, I was also able, in connection with the work of that Department, and without expense to the Museum, to secure the services of Dr. S. W. Williston, of New Haven, during January and February, in arranging a large part of the Diptera and more particularly the Syrphidæ.

In like manner the services of Prof. H. Osborn, of Ames, Iowa, were obtained, and he rearranged and classified the collection of Hemiptera Heteroptera according to Uhler's new list issued during the year.*

A large number of exotic Lepidoptera of the Museum were unnamed, and the assistant was directed to make two trips to New York City, and there succeeded in identifying most of the species.

It is noteworthy, as illustrating the rich accumulations now comprising this national collection, that each of these specialists found much of interest and very many new or undescribed species and even new genera. Added to the work here indicated must be mentioned my individual efforts in the rearranging and perfecting of different families in several orders, but more particularly in the Micro-Lepidoptera. My health having broken down last spring, I was forced to seek its restoration in rest from work, and in a trip made to Europe I took with me much undetermined material, especially in Tortricidæ, Tineidæ, and Pyralidæ. Here again the amount of undescribed material proved very large, and much of it will be described before long by Ragonot, of Paris, and Lord Walsingham, of England, to whom, for much courteous aid already given, I take this opportunity of publicly expressing my thanks.

It is a matter of some difficulty to make anything like an accurate statement of the number of specimens or species in the collection—the former runs up into the hundreds of thousands, the latter well into the tens of thousands. So far as the data are accurately obtainable the collection consists of the following:

EXHIBIT COLLECTION.

Number of cases on exhibition	9
Wall-screen cases	4
Wall-screen frames for pictures	2
Total	15

* Check List of the Hemiptera Heteroptera of North America, by Philip R. Uhler, Brooklyn Ent. Soc., Brooklyn, N. Y., February, 1886.

The exhibition collection is classified as follows:

Economic collection.—This is comprised in five cases containing twenty-four unit boxes (two of the cases being filled with machinery), and one wall screen of sixty framed pictures representing insecticide appliances.

A statement of the nature of this collection was given in my last annual report, the arrangement showing number of specimens and species as follows:

	Specimens.	Species.	Samples of work.
Injurious to apple	66	45	34
Injurious to enemies of same	37	10	.....
Injurious to pear	8	9	7
Injurious to peach	17	9	9
Enemies of same	1	1	.....
Injurious to orange	30	16	14
Scale insects—large numbers.			
Enemies to Scale and other insects	36	23	.....
Injurious to strawberry	20	12	3
Enemies	2	1	.....
Injurious to raspberry	16	9	7
Injurious to currant	4	5	4
Enemies	2	1	.....
Injurious to gooseberry	5	3	.....
Injurious to melon	16	7	.....
Enemies	1	1	.....
Injurious to cranberry	13	8	1
Enemies	1	1	.....
Injurious to persimmon	12	5	4
Enemies	1	1	.....
Injurious to grape	68	43	41
Enemies	4	3	.....
Injurious to sugar cane	8	2	9
Injurious to hops	6	5	4
Enemies	1	1	.....
Injurious to rice	8	4	4
Enemies	1	1	.....
Injurious to Indian corn	34	20	.....
Enemies	6	5	26
Injurious to small grain	84	28	30
Enemies	23	23	.....
Injurious to stored grains	32	13	11
Injurious to cotton	41	18	5
Enemies	24	16	.....
Injurious to grass	57	28	6
Enemies	16	14	.....
Injurious to clover	63	29	20
Enemies	2	2	.....
Injurious to pea and bean	9	6	15
Injurious to cabbage and cauliflower	44	16	8
Enemies	11	7	.....
Injurious to sweet potato	14	7	4
Injurious to potato	20	11	2
Enemies	25	17	.....
Injurious to tomato	6	4	.....
Enemies	6	2	.....
Injurious to tobacco	13	3	1
Injurious to asparagus	12	1	1
Injurious to onion	3	2	.....
Injurious to stock	15	4	.....
Total	944	502	270

The total number of specimens given is somewhat misleading, because occasionally, as in the Coccidæ, a branch or leaf contains dozens, here been counted as one, and so also of a larva, pupa, and imago, or pupa and imago which are often counted as one. A group of parasites gregarious on a larva is also often counted as a single specimen.

In addition there are to almost every species drawings, or figures, specially printed from the woodcuts in my reports on the Insects of Missouri or in the reports of the Department of Agriculture, which enhance the value of the collection and render it more instructive to those interested in agriculture.

Added to and forming a part of this collection are four unit boxes containing samples of forty different insecticide substances, four unit boxes containing forty-three different kinds of nozzles for spraying, a box containing various kinds of fly papers, and two large cases containing twenty-five different kinds of pumps, bellows, blowers, etc., for applying poisons to plants.

The collection of forestry insects is included in eight unit boxes, and is arranged on a plan similar to that of the preceding collection, the insects affecting each tree being grouped so as to show the manner of work. Like that collection, it is also profusely illustrated with figures from the reports above mentioned.

It contains as follows:

Injurious to—	Specimens.	Species.	Samples of work.
Pine	34	32	22
Evergreen	17	7	13
Celtis	13	7	10
Locust	11	8	6
Ailanthus	1	1	.....
Tulip tree	1	1	.....
Willow	41	28	13
Poplar	16	8	12
Magnolia	1	1	.....
Ash	2	2	2
Sassafras	1	1	.....
Linden	13	11	7
Persimmon	4	2	.....
Sweet-gum	3	2	.....
June or service berry	1	1	1
Wild cherry	7	5	3
Alder	4	3	2
Pear or thorn	3	3	4
Mesquite	1	1	1
Paper mulberry	3	2	2
Bumelia lycioides	3	3	.....
Oak (galls)	63	46	.....
Oak	78	46	17
Maple	30	25	15
Hickory	24	20	10
Elm	12	9	5
Total	387	275	145

Galls and gall insects.—As pertaining rather more to this portion of the collection it is well to mention here a collection of specimens and drawings of European galls and gall insects prepared by the late Andrew W. Murray and received by the Museum from the Centennial Exposition at Philadelphia, containing specimens or drawings of 212 species, with admirable enlarged diagrams of structure and economy.

Silk culture.—The exhibit consists of two or really three parts:

(1) Thirty Japanese pictures, framed on a wall screen showing methods or silk culture in Japan, and 17 specimens of the stands, trays, and boxes illustrated.

(2) Two unit boxes containing 7 species and 15 specimens of native and foreign silk worms, and 215 specimens or samples of silk, from the division of silk culture, Bureau of Entomology, Department of Agriculture.

(3) Six unit boxes received from Mr. R. Hitchcock, containing 48 sorts or varieties of cocoons, and silk in various forms, and about 300 specimens all told.

Insect architecture.—Two wall screen cases contain 30 specimens of insect architecture, mostly the work of Hymenoptera. This collection is still very incomplete, and it is intended at some future date to enlarge this portion of the exhibit so as to give a fair idea of the variety and skill of insects in all branches of building.

Synoptic collection.—This collection is intended to give to the student and general visitor an outline of the classification of insects. Starting with a definition of the class, and a brief description of each order, the peculiar features only being given, and drawings or specimens illustrating each definition.

This box contains 62 species and 78 specimens besides the drawings.

Two boxes are devoted to Lepidoptera, and contain definitions of all the families, drawings of venation, and other structural details. They contain 62 species and 121 specimens.

One box is devoted to Hemiptera, and this is still incomplete in the section Homoptera. The section Heteroptera contains 26 species and 130 specimens. It is designed to continue work on this collection and to cover all orders in the same way; but the work is an extremely slow one, requiring much time and labor in the preparation of drawings, the selection of material, and its proper arrangement.

Show collection.—This contains twenty unit boxes of insects; foreign Coleoptera and Lepidoptera, selected to please that portion of the visitors to the Museum that care only to feast the eye. It contains showy butterflies, immense moths, and beetles of bizarre shape and coloring; it is separated as follows:

	Species.	Specimens.
European Lepidoptera, classified and named, giving a fair idea of the fauna:		
Eight unit boxes containing	374	936
Japanese butterflies and moths:		
Four unit boxes containing	80	220
Exotic Lepidoptera, various localities:		
One case, containing	34	66
Brazilian butterflies:		
One case, containing	30	96
Mexican Lepidoptera:		
One case, containing	19	52
South American Lepidoptera:		
One case, containing	24	52
European Coleoptera, illustrating the more common species:		
Two unit boxes, containing	200	956
Mexican Coleoptera:		
One box, containing	63	516
Central American Coleoptera:		
One box, containing	46	382
Total	870	3,276

It would thus appear in a summarized form that there are on exhibition:

	Species.	Specimens.	Samples of work.
Economic collection	502	944	270
Forestry insects	275	387	145
Galls and gall insects	212	212	212
Silk culture	56	300	300
Insect architecture	30	30	30
Synoptic collection	152	329	.....
Show collection	870	3,276	.....
Total on exhibition	2,097	5,478	957
Machinery, pumps, bellows, etc	.....	.....	95
Poisons	.....	.....	40
Framed pictures, not counting those in boxes	.....	.....	90

In formally donating my private collection, I submitted a year ago, at the request of the Assistant Secretary, a statement of the condition and extent of the systematic or study collection, which included, besides my own already alluded to, the collection proper of the Department of Agriculture. This last comprised some five hundred folding boxes and one hundred and twenty-three odd boxes, many of them but partly filled and duplicating in great measure those in the Riley collection. It also contained a large assortment of slides and alcoholic specimens accumulated during the past seven years. There were also some twenty-four hanging glass drawers, prepared by the late F. G. Sanborn

for the exhibit of the department at the Centennial Exposition, and now much faded and injured by exposure.

All the folding boxes have been made since I first took charge of the division in 1878, and after the pattern of my own. Three hundred of them contain a tolerable classified collection, chiefly of Coleoptera and Lepidoptera, arranged while Professor Comstock was in charge of the division. The specimens are, as a rule, in rather poor condition, and include comparatively few species not included in the other; indeed they may be looked upon as duplicates and have been rarely used in the work of the division. The other boxes contained all the more recent material collected for, or reared at, the department during the years 1881–1884, and including the Brazilian collections of Dr. J. C. Branner and Mr. Albert Koebele. This material is separated by orders but not yet carefully worked over or classified. They also include some few purchases from Messrs. H. K. Morrison and William Wittfield, the exotic Coleoptera from the administrators of the Belfrage estate and the Burgess collection of Diptera.

This collection includes many undescribed species in all orders, and a rough estimate indicates that there are about 50,000 specimens and probably 5,000 species, mostly exotic, not in the Riley collection. If to this statement the accessions of the year, as indicated under that head, are added, a good idea of the present extent of the national collection may be formed.

The collection of Lepidoptera, so far as rearranged, contains as follows:

	Species and varieties.	Specimens.
Rhopalocera	395	1,243
Sphingidæ	62	144
Sesiidæ*	4	10
Thyridæ	2	6
Agaristidæ	4	12
Syntomoidæ	7	23
Pyromorphidæ	4	21
Cydosiidæ	3	8
Ctenuchidæ	7	23
Lithosiidæ	10	35
Arctiidæ	63	246
	561	1,771
Duplicates	75	333
Total	636	2,104

* Not all the material is incorporated here.

With a view of aiding outside investigators who could not come to Washington, the material in the families Throscidæ, Eucnemidæ, and the genus Chrysobothris in Coleoptera, were sent to Dr. George H.

Horn, of Philadelphia, for study and determination, and his paper on Chrysobothris, based partly on this material, has appeared in the Trans. Am. Ent. Soc. (Vol. XIII). The Odyneridæ were sent to Mr. William Couper, Troy, N. Y., for study and determination, but no report has yet been received from him; while some material in Cerambycidæ has been loaned to Mr. C. W. Leng, and some few duplicate butterflies given to Mr. William H. Edwards, Coalburgh, W. Va.

In response to a request of Prof. L. M. Underwood, of Syracuse, N. Y., the Myriapods of the collection were selected out, carefully packed in eighty-two bottles and vials, and sent to him for study and determination. No report has as yet been made upon these insects.

REPORT ON THE DEPARTMENT OF MARINE INVERTEBRATES IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By RICHARD RATHBUN, *Curator.*

The total number of accessions received by this department during the past year was 48, of which the most important were contributed by the U. S. Fish Commission. The explorations of the steamer *Albatross*, elsewhere described in this report, extended from the eastern edge of the Grand Bank of Newfoundland to the Gulf of Mexico, and into a depth of 2,731 fathoms, large collections of marine animals having been made in all parts of this region. The collections obtained during the summer and early fall months were assorted and partly classified at the Wood's Holl station of the Commission, and the material sent from there to Washington filled over 1,300 packages of all sizes, many containing a large number of species each and hundreds of specimens. On the return trip to Washington, in October, the *Albatross* engaged in dredging and fishing off the Atlantic coast of the Southern States, between Cape Hatteras and Savannah, and 190 packages of unassorted marine invertebrates were brought directly to the National Museum. During the last part of the winter and the spring of 1886 the same steamer made a combined sounding and dredging voyage to the region of the Bahamas, the Gulf Stream off Florida, and the eastern part of the Gulf of Mexico, returning with about 400 packages of specimens belonging to this department. Twenty of these packages were large tanks and barrels, containing a multitude of choice objects from both deep and shallow water. Reports upon the zoological results of these explorations are now in progress, but it would be impossible, in a few words, to describe even the general character of the materials obtained.

Mr. V. N. Edwards, who is stationed at Wood's Holl, Mass., in the employ of the Fish Commission, during the entire year has continued to send in valuable collections made during those months when the sea-shore is seldom visited by naturalists. Many interesting specimens of fresh-water crustaceans and annelids, representing four distinct river basins in the northern part of Virginia, have been contributed by Col. Marshall McDonald, of the same Commission. His collections were accompanied by full notes, including temperature observations, afford-

ing important data bearing upon the distribution of the species. One hundred and three packages, containing 48 species of crustacea, collected mainly during the southern cruises of the *Albatross*, have been returned by Prof. S. I. Smith, of Yale College, to whom they had been sent for study.

To the Navy Department the Museum is indebted for a large series of specimens of deep-sea soundings obtained by the U. S. steamer *Enterprise*, Commander A. S. Barker, U. S. Navy, commanding, during a voyage from Wellington, New Zealand, to the United States, through the South Pacific and Atlantic Oceans. From Dr. T. H. Streets, U. S. Navy, of the Coast Survey steamer *Carlisle Patterson*, there has been received a fine alcoholic collection of echinoderms, crustaceans, and other groups of marine invertebrates, collected mainly in southern Alaska; and Dr. W. H. Jones, U. S. Navy, has also contributed a small collection of the same character from Iquique, Peru.

The collection made by Capt. M. A. Healy, of the U. S. revenue steamer *Corwin*, during the summer cruise of 1885 in the Arctic Ocean, Bering Sea, and elsewhere on the coast of Alaska, adds many interesting specimens from an important region, which is also further represented by a large series of small crustacean forms from Bering Island, Siberia, donated by Mr. N. Grebnitska, through Mr. Leonhard Stejneger of the National Museum. Mr. James G. Swan, of Port Townsend, Wash., has sent a fine assortment of dried hydroids, corallines, and barnacles from Cape Flattery, and the Museum of Comparative Zoology has added three rare species of crayfishes to our already large and carefully prepared collection of that group. These species are as follows: *Astacus pallipes* Lereb., from Switzerland; *Cambarus cubensis* Erich., from Cuba; and *Cambarus Putnami* Fax., from Kentucky.

One of the most important additions to the department has been obtained from the Rev. A. M. Norman, of England, in exchange. It consists of 268 microscopic mountings of the spicules and sections of British sponges contained in the collection of Mr. Norman. The number of species represented is 189. Mr. Norman states that the mountings were made exclusively from specimens determined by the late Dr. Bowerbank, and in many instances they are from the type, which is very often unique. This collection will prove invaluable to any student who may undertake the study of the American species of sponges.

On June 18, 1885, the curator and his assistants went to Wood's Holl, Mass., to take part in the sea-coast explorations of the U. S. Fish Commission, which were continued until about October 10, 1886. During this time work on the collections in Washington was entirely suspended, but many fine preparations of marine animals were made for the exhibition cases of the Museum and for the study series. After leaving Wood's Holl, in October, the curator visited the Museum of Comparative Zoology, Cambridge, Mass., for the purpose of identifying certain species of sea-urchins which could not be determined otherwise, and the col-

lection of specimens of that group has now been placed in perfect order up to date.

Important changes have been made during the year in the arrangement of all the collections in the department, which are now in better condition than ever before, notwithstanding that much time was necessarily occupied in caring for the new material received. The west hall of the Smithsonian Institution, intended for the exhibition of marine invertebrates, was used, as during 1884 and 1885, as a general work-room and store-room, but in June last it was permanently opened to the public. The display series contained in the wall cases surrounding this hall remains in the same condition as heretofore, but four additional upright cases and four table cases have been supplied, and these are now temporarily filled with corals, crinoids, echinoderms, and other showy and instructive forms. All of the dried specimens of the general collection that could not be stored under the exhibition cases have been transferred to the northwest gallery of the bird hall, where they are mostly contained in unit trays piled upon the floor. This gallery will be used hereafter as the main work-room for the examination of the collections of dried materials, which are growing rapidly in size and value every year, but the lack of suitable cases prevents a permanent and satisfactory arrangement of the specimens. Temporary wall cases at one end of the gallery are still used for storing bottles and jars of alcoholic specimens, and a large number of the homeopathic vials are also cared for here.

The alcoholic collections hitherto contained in the wall cases on the southwest floor of the bird hall have been transferred to the basement.

The additional space in the basement allotted to this department for the storage of alcoholic specimens has been a great convenience and has permitted a satisfactory disposition of the collections, but there is little room for expansion, and further accommodations will probably be necessary in the course of a year or two. The new quarters consist of the western half of the old general storage-room under the main part of the building, which has been fitted up with plain shelving, occupying all available space. The alcoholic collections are now distributed as follows: The small room originally assigned to this department contains the identified collections of crustacea and parts of those of other groups, and serves as an alcoholic work-room. The cases in the adjoining hall are used for the alcoholic Echini, while the Ophiurans and star-fishes are stored in the next connecting hall leading to the new store-room. The latter is filled mainly with unidentified collections and the duplicates. The rearrangement of the alcoholic collections in the above order occupied several months, and advantage was taken of the general overhauling to renew the alcohol in nearly all the jars and bottles. The old alcohol was at once redistilled and used again, and new alcohol was employed only where full strength was required.

All of the accessions received during the year have been assorted and catalogued, and some of the groups sent away to specialists for study.

The fine series of stalked crinoids obtained by the steamer *Albatross* in the Gulf of Mexico during the past three years has been transferred to large glass jars for safe storage, and every specimen labeled separately. The entire collection of star-fishes contributed by the Fish Commission, and representing the deep-sea explorations of the steamers *Albatross* and *Fish Hawk*, has been carefully gone over and the reserve series selected out and properly arranged. Large numbers of specimens were dried and many duplicates set aside for distribution and exchange.

Mr. A. H. Baldwin and Miss M. J. Rathbun have acted as assistants in this department during the entire year. Mr. Baldwin has been occupied mainly with the sorting and cataloguing of collections and with the rearrangement of the alcoholic specimens above described. Miss Rathbun has assisted the curator more directly in caring for and cataloguing the dried specimens and those contained in homeopathic vials, and in preparing work for the Fish Commission, especially in the line of ocean temperature observations.

During the summer of 1885, while at Wood's Holl, Mass., the curator began the experiments with respect to the artificial propagation of lobsters, which were continued with great success during the spring of 1886 by Capt. H. C. Chester and Mr. John A. Ryder. Acting upon information obtained from Norway that the eggs of the lobster could be kept alive and hatched even if removed from the body of the parent, several trials were made with the hatching apparatus then in use, although it was known that the hatching season for the year was over. The purpose of these experiments was to ascertain the best methods of handling the eggs, in order that there might be as little delay as possible in commencing work the following spring. The best results were obtained with the McDonald shad-hatching jar, and although considerable inconvenience was experienced from the amount of sediment and iron rust in the water, the eggs were retained in good condition for a period of over two months. An account of these experiments is given in Vol. VI of the Bulletin of the U. S. Fish Commission. During the spring of this year an entirely new style of jar, devised by Captain Chester for cod eggs, was used for the lobsters and many thousands of eggs were easily hatched.

The writer has been engaged during the entire year, with the assistance of Miss Rathbun, in reducing and tabulating for publication the surface temperature observations made for the Fish Commission by the Light-House Board and the U. S. Signal Service, at about sixty stations distributed along the eastern and southern sea-coasts of the United States, from Maine to Texas. These observations, it is expected, will prove of great value in helping to explain the local movements and general migrations of fishes, a study coming within the scope of that Commission. Thirty-two graphic charts representing twenty-four stations had been prepared up to the close of the year. A separate chart,

showing the variation of temperature by ten-day means for the five years preceding 1886, is given for each station, and there are also six charts of isothermal lines connecting all the stations. This work will be carried on during next year.

At Wood's Holl the curator continued his studies of the parasitic copepods of the Atlantic coast, completing and submitting for publication a report upon six species, four of which are new to science. All of the species are figured more or less in detail. After leaving Wood's Holl he completed the identification of the undetermined species of Echini, in the collection of the Museum, for that purpose visiting the Museum of Comparative Zoology at Cambridge, Mass., where he was given the opportunity of making comparisons with the unrivalled collection of Mr. Alexander Agassiz, by whom personal assistance was also kindly rendered. The Echini obtained by the steamer *Albatross* in the region of the Bahama Islands during the spring of 1886 were also identified, and have been included in a general catalogue of the collection of Echini belonging to the National Museum, to be published in the Proceedings. Since completing work upon the Echini the curator has begun to revise the collection of star-fishes in the same manner, and during the spring of 1886 made a complete overhauling of all the species collected by the Fish Commission on the Atlantic coast of the United States north of Cape Hatteras. Most of these species had been determined by Professor Verrill, but it was found convenient to make a selection of the specimens intended for the reserve series, and to dry large numbers of specimens in order to reduce the bulk of the alcoholic materials. Many specimens of star-fishes from other sources have also been identified.

The study of Fish Commission collections of marine invertebrates elsewhere than at the National Museum has been continued by the same persons enumerated in the report of last year. Prof. A. E. Verril, of Yale College, has had general supervision of the collections made from Cape Hatteras northward, but has been occupied mainly with the Mollusca, Echinodermata, and Anthozoa. He has been assisted specially by Miss Katharine J. Bush, who has also reported directly upon some portions of the mollusca. Prof. S. I. Smith, of the same college, has been charged with the study of the crustacea, and all collections of this group, except a few of the minor divisions, are submitted to him. Other collaborators during the year have been Prof. L. A. Lee, of Bowdoin College, on the Foraminifera; Prof. Edwin Linton, of Washington and Jefferson College, and Prof. B. F. Koons, of the Storrs Agricultural School, on the internal parasites of fishes; Mr. James E. Benedict, of the steamer *Albatross*, on the Annelids; Mr. J. Walter Fewkes, of the Museum of Comparative Zoology, on the free Medusæ.

The Hon. Theodore Lyman, of Brookline, Mass., has kindly offered to examine and report upon the ophiurans from the western coast of America in addition to those collected by the steamer *Albatross* south

of Cape Hatteras, on the eastern coast. The collections from the Pacific coast of the United States and from Alaska and other northern regions were accordingly sent to him at the Museum of Comparative Zoology, Cambridge, and at the close of the year he had nearly completed his work upon them. With Mr. Lyman's assistance it will be possible soon to place this group in as complete order as the echini.

EXPLORATIONS.

The steamer *Albatross*, Lieut. Commander Z. L. Tanner, U. S. Navy, commanding, continued in service during a large part of the year, and accomplished very important results for the fisheries and for natural history, as well as in matters of special hydrographic interest. The permanent naturalists were Mr. James E. Benedict and Mr. Thomas Lee, but Mr. Sanderson Smith also accompanied the steamer on all its trips during the summer and fall, and Mr. Willard Nye, jr., Mr. C. H. Townsend, and Mr. F. Washburn participated in the spring cruise to the Bahama region.

The *Albatross* left Newport, R. I., June 17, 1885, on its first cruise to the fishing-grounds off the coast of the maritime provinces. The mythical Hope Bank of the fishermen, said to be located in about latitude 41° N., longitude 64° W., was the first objective point, and considerable time was spent in making soundings in its supposed position. The average depths observed were about 1,900 or 2,000 fathoms, with no indications of shoal water. Farther to the eastward several reported dangers, such as Watson's, Hamilton's, Daraith's, and Akett's, located between latitudes 40° and 41° N., and longitude about 55° W., were also investigated without obtaining other than very deep soundings. From this point the *Albatross* steamed to the southern part of the Grand Bank of Newfoundland, where dredging and fishing were begun. A line of twenty-nine stations was run along the eastern side of the bank, terminating near the Virgin Rocks. The depths ranged from 33 to 826 fathoms, and the work covered all characters of bottom occurring in that region. After spending a few days in the harbor of St. John's, the steamer started westward on July 2, making four dredgings during the first day out between the southeastern coast of Newfoundland and the Grand Bank, in depths of 86 to 89 fathoms. Thence the cruise extended over Green and St. Peter's Banks, where the depths were all less than 36 fathoms, to the channel between St. Peter's and Banquereau, in depths of 114 to 265 fathoms, and the eastern edge of Banquereau, in depths of 33 to 39 fathoms.

Misaine Bank, off Nova Scotia, was next visited, and a line of dredging and fishing stations was made across it from east to west. This shoal water had been previously regarded by American fishermen as comparatively barren, but the investigations of the *Albatross* showed it to be an important feeding-ground for cod, large numbers of which were captured with hook and line. These explorations were continued

from Misaine Bank to Middle Ground, on the northern side of Sable Island Bank, and thence to Halifax. From the latter place the steamer returned to Wood's Holl, Mass., by way of Le Have Bank and the deep water off the eastern and southeastern borders of George's Bank, many dredgings being made in depths of 52 to 1,234 fathoms. During this cruise, which lasted from June 17 to July 15, one hundred and nine hauls (stations 2427 to 2535) were made with the dredge and beam trawl, and fishing was actively engaged in wherever the depths gave promise of good results.

During the remainder of the summer the *Albatross* was employed off the coast of southern New England and Long Island, going to the eastward as far as longitude 65° 08′ W., the most distant station being located in latitude 37° 23′ N., longitude 68° 08′ W., or about 240 miles southeast of Martha's Vineyard, where a depth of 2,731 fathoms was obtained. Fifty-six stations (2536 to 2591), with depths of 18 to 2,731 fathoms were made, with very important biological and physical results. On the return trip to Washington, in October, explorations were carried on off the coasts of North and South Carolina, between Capes Hatteras and Romain, thirty-seven hauls (2592 to 2628) being taken in depths of 9 to 528 fathoms.

The spring explorations of the *Albatross* in the region of the Bahama Islands began the last part of February and terminated early in May. They were conducted in the combined interests of the U. S. Hydrographic Office and the Fish Commission, but consisted mainly of deep-sea soundings for the benefit of the former service. Dredgings were made in the so-called "Tongue of Ocean," in some parts of which the depths exceed 1,000 fathoms, with unexpected results, the bottom nearly everywhere being composed of coral mud, utterly barren of life, and therefore of little biological interest; but many valuable specimens were obtained from the shallow waters among the reefs and islands. During a trip to Key West for the purpose of coaling, a few hauls were made off Havana and in the Straits of Florida, off the northeastern part of the Florida Reefs. On the homeward trip a line of dredgings was also carried northward from Little Bahama Bank to Cape Fear, North Carolina. During this cruise fifty-one dredgings were made in depths of 36 to 1,169 fathoms (stations 2629 to 2679).

The total number of dredging stations made by the steamer *Albatross* during the year was 253, being designated by serial numbers 2427 to 2679, inclusive. Very large collections were obtained in all branches of marine zoology, the study of which will be of great scientific and practical interest. The area covered extends from the eastern edge of the Grand Bank of Newfoundland to the Gulf of Mexico, and the depths explored range from shallow water to 2,731 fathoms. An account of the collections and of the work done upon them is given elsewhere.

The marine station of the Fish Commission at Wood's Holl, Mass., was occupied as the headquarters of explorations from about June 18

until about October 10, 1885. Professor Baird, the Commissioner of Fisheries, was present during the entire season and retained general supervision of the work. Prof. A. E. Verrill was in charge of the laboratory during the time he was able to be in Wood's Holl, this duty devolving upon the curator during his absence. Many members of the permanent staff of the Commission and National Museum were in attendance. Prof. G. Brown Goode and Dr. T. H. Bean spent several weeks investigating the fishes brought in by the *Albatross*, and were assisted by Mr. Peter Parker, jr. Dr. J. H. Kidder, chemist and physicist, and Mr. John A. Ryder, embryologist, were also present, and the curator was accompanied by his two assistants, Mr. A. H. Baldwin and Miss M. J. Rathbun.

The remainder of the party was composed as follows: Prof. A. E. Verrill, of Yale College, assisted by Miss K. J. Bush and Miss C. E. Bush; Prof. S. I. Smith, of Yale College; Mr. Sanderson Smith, of the American Museum of Natural History, New York; Prof. Leslie A. Lee, of Bowdoin College, Maine; Prof. Edwin Linton, of Washington and Jefferson College, Pennsylvania; Prof. B. F. Koons, of the Storrs Agricultural School, Connecticut; and Mr. J. H. Blake, of Cambridge, Mass., as artist. Prof. William Libbey, of Princeton College, was present during several weeks as an independent worker.

The following institutions have been supplied with sets of duplicate specimens belonging to the regular series described in previous reports. The total number of species distributed was about 200, the number of specimens about 18,000.

Bryn Mawr College, Bryn Mawr, Pa.; Centenary Female College, Cleveland, Tenn.; Board of Education, South Pueblo, Colo.; Amity College, College Springs, Iowa; The public schools, Moline, Ill.; Sedalia Natural History Society, Sedalia, Mo.; Geneva Public School, Lake Geneva, Wis.; Pennsylvania Institution for the Instruction of the Blind, Philadelphia, Pa.; Elkhorn High School, Elkhorn, Wis.; High School, Weeping Water, Nebr.; Delphi High School, Delphi, Ind.; Elgin Scientific Society, Elgin, Ill.; Friends' Central School, Philadelphia, Pa.; Ogontz School, Ogontz, Pa.; Crown Point Public School Museum, Crown Point, Ind.; Dickinson Seminary, Williamsport, Pa.; Lake View High School, Lake View, Ill.; Allegheny College, Meadville, Pa.; Tuft's College, Medford, Mass.; Bethany Normal Institute, Lindsborg, Kans.; Board of Education, Naperville, Ill.; Augustana College, Rock Island, Ill.; Morristown Seminary and Normal Institute, Morristown, Tenn.; Sedalia University, Sedalia, Mo.; Minnesota Academy of Sciences, Minneapolis, Minn.; High School, Lafayette, Ind.; Doane College, Crete, Nebr.; Indiana State Normal School, Terre Haute, Ind.; Society of Natural History, St. John, New Brunswick; Trinity Medical School, Toronto, Canada; Mexican Exploring Commission, Mexico.

Special sets of duplicates, containing from eleven to forty-five species

each, were sent out in exchange to the following institutions and individuals: ·

The Museum of Comparative Zoology, Cambridge, Mass.; The American Museum of Natural History, New York City; The Minnesota Academy of Natural Sciences, Minneapolis, Minn.; Tuft's College, Medford, Mass.; Dr. E. C. Black, Wheatland, Ind.; Mrs. John D. Swan, Antwerp, N. Y.; Prof. A. Dugès, Guanajuato, Mexico.

STATEMENT OF ENTRIES IN THE RECORD-BOOKS FROM JULY 1, 1885, TO JULY 1, 1886.

Name of group.	Entries to July 1, 1885.	Entries to July 1, 1886.	Entries during the year.
Crustaceans	10,127	11,610	1,483
Worms	1,114	1,352	238
Tunicates and Bryozoa	545	829	284
Radiates	11,030	14,771	3,741
Sponges and Protozoans	4,000	5,328	1,328
Total	26,816	33,890	7,074

REPORT ON THE DEPARTMENT OF COMPARATIVE ANATOMY IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By FREDERICK W. TRUE, *Acting Curator.*

This department, which at present is in reality a department of comparative osteology, can scarcely be considered as having an independent existence. Its collections are based on material formerly assigned to the four departments which have to do with vertebrate animals, and it is dependent upon the latter for its accessions. It has been the custom as regards important vertebrates received in the flesh to separate the skeleton entirely from the skin, and to prepare the former for this department, the skull and leg bone being replaced by the taxidermist by wooden models. Specimens in alcohol are to a certain extent treated in the same manner. A list of accessions to this department, therefore, would be largely a repetition of the lists submitted by the four vertebrate departments.

Since it has been established, however, a certain amount of material has found its way into the department directly. The more important of these accessions will be mentioned.

Important aid toward building up a collection of domestic animals has been received from the authorities of the Washington Board of Health, who gave us permission to select from the dog pound such dogs as were desired for our series. These animals, of course, have no pedigree and are judged by the points they exhibit. It will probably be found best in the end to replace them as far as possible by others whose pedigree is known, though some of them are very fine specimens of the races they represent. The following breeds have been obtained from the pound during the year.

Newfoundland dog.
Skye terrier.
Black and tan terrier.
Bull terrier.
Coach dog.
Scotch terrier.
Scotch and Skye terrier (cross).
Bull dog.
Italian greyhound.

Several thoroughbred dogs, with pedigrees, have been received, notably two collies, "Nesta," from H. T. Leeper, esq., East Bethlehem, Pa., and "Clipsetta," from James Watson, esq., of the same town. A coach dog was received from Lewis Hipkins, esq., and an Irish setter from

James T. Walker, esq. In exchange for specimens from the Museum, Prof. Dr. Alf. Nehring, of Berlin, sent the skeleton of a dachshund and the skull of a Syrian street dog. Dr. E. Bessels presented the skeleton of a greyhound.

Lithographic pictures of General Grant's Arabian horses were presented by Mr. Randolph Huntington, of Rochester, N. Y.

Among the important specimens of aquatic mammals, in addition to those referred in the report on the Department of Mammals (pp. 147–148) may be mentioned the skull of Steller's sea-lion, *Eumetopias Stelleri*, a skull of the Pacific walrus, and a skeleton of the sea-otter presented by Dr. L. Stejneger. The curator procured at Hatteras, through the kindness of Col. John Wainwright, of the Wilmington Oil and Leather Company, a number of foetal skulls of the bottlenosed dolphin, *Tursiops tursio*.

Among terrestrial mammals may be mentioned the skeleton of an European badger, *Meles taxus*, prepared from a fresh specimen received without indication of the donor. A skeleton of *Cynopithecus niger* was prepared from a fresh specimen received from Dr. W. A. Conklin.

A valuable series of skeletons of birds of the North Pacific was collected by Charles H. Townsend, esq. A collection of skeletons of Florida species was presented by Dr. B. H. Warner.

The most important fishes received during the year were *Tetrapturus albidus*, *Coryphæna punctulata*, and *Caranx pisquetas*, the first from Joseph Wharton, esq., and the remaining two from the U. S. Fish Commission.

No new lines of work have entered upon since the close of the last fiscal year, but we have occupied ourselves with the expansion and perfection of the exhibition series and the better arrangement of the duplicate material. Each of the different series mentioned in the previous report—the morphological series, the systematic series, and the series illustrating the races of domestic animals—has received some important addition from the hands of the preparators. The exhibition cases, though not entirely full, are all occupied by a greater or less number of specimens of representative species. The number of exhibition and storage cases in the hall June 30, 1886, was as follows:

Unit pyramidal table-cases	8
Unit square table-cases	10
One-half unit pyramidal table-cases	6
One-half unit square table-cases	2
Door-screen cases	1
Unit storage cases	18
One-half unit storage cases	8
Movable cases	7
Stationary wall-case (exhibition)	1
Stationary wall-case (storage)	1
Total exhibition cases	28
Total storage cases	26

This number of cases is practically the same as that given last year. The two cases styled "experimental anatomical" and "alcove" were removed because not immediately useful.

The present is a somewhat inopportune time for a report upon the additions to the exhibition series, for the reason that the osteological preparators have been largely occupied in roughing out and cleaning material rather than in mounting it for exhibition. Reference to the statistics in the report of the osteological preparator will show that a large number of specimens were cleaned during the year, and the following statistics of the number put on exhibition should not, therefore, be taken as representing the entire work of the preparators. During the coming year the proportion of specimens respectively cleaned and mounted will probably be reversed.

The number of skeletons, skulls, and other pieces placed on exhibition during the year is as follows:

SKELETONS.

Mammals	16
Birds	15
Reptiles and batrachians	15
Fishes	12
Total	58

SKULLS.

Mammals	5
Birds	9
Total	14
Morphological series:	
Number of pieces	68
Domestic animals:	
Skeletons (dogs)	3

Among the more important mammals added were the skeletons of a tiger, a black-tailed deer, and a piked whale; skulls of a hippopotamus and killer whale. Among the birds may be mentioned the skeletons of *Apteryx australis*, *Rhea americana* and the Crested Auk. The skeleton of a large python is interesting both as representing the larger serpents and as an unusually fine osteological preparation.

In August the cases were rearranged with reference to the classification of their contents and with the view of obtaining better circulation aisles. The present grouping (with the cases now in use) is very satisfactory, but has the disadvantage of breaking the long vistas which are preserved elsewhere in the building. If a change be made for the purpose of restoring the vistas a number of low, narrow cases of a style not hitherto brought into requisition will be needed.

New pedestals for the whale skulls and other specimens not under cover were completed in September. They add much to the appearance of the hall. A considerable number of pictures of skeletons and species not in the collections were framed and placed on exhibition during the year, and with the elephant tusks, antlers, and sawfish saws serve to adorn the walls.

The study series has received constant additions from the Preparator's laboratory. The statistics of this work will be found in the Preparator's report (p. ——.)

The card catalogue of the mammals is practically completed, and only a small number of unidentified specimens still remain to be added. Catalogues of the birds, reptiles, batrachians, and fishes have not been undertaken. They can hardly be made with the present limited clerical aid.

Very few specimens have been distributed during the year. Skulls of the Pacific walrus and mountain sheep were sent to George A. Boardman, esq., as a partial return for numerous specimens presented to the Museum. Dr. L. Stejneger received his quota (as collector) of the specimens obtained by him in the Bering Islands and Kamtschatka. Skeletons of a monkey, *Cercopithecus rufoviridis*, and a python, *Python molurus*, were forwarded to Dr. A. R. C. Selwyn, director of the Geological Survey of Canada, in return for invertebrate fossils presented to the Museum.

The only specimens loaned for study were two skulls of *Putorius nigripes*, which went to Dr. C. H. Merriman, and a skull of *Spermophilus tereticaudus*, which was examined by Dr. J. A. Allen.

The entire collection being accessible at the close of the past year, it was deemed best to replace the estimates of the number of specimens in the collection by statistics based on actual count. The figures may be relied upon as representing the actual number of osteological species in the department June 30, 1886.

Skeletons.		*Skulls.*	
Mammals	814	Mammals	4,594
Birds	447	Birds	1,760
Reptiles and batrachians	201	Reptiles and batrachians	74
Fishes	525	Fishes	153
Total	1,987	Total	6,581

Birds' sterna	1,519
Antlers	89
Casts of brains	34

The exhibition series comprised the following number of specimens of each class:

Skeletons.		*Skulls.*	
Mammals	165	Mammals	71
Birds	24	Birds	16
Reptiles and batrachians	25	Reptiles and batrachians	2
Fishes	26	Fishes	0
Total	240	Total	89

Pieces in morphological series	55
Teeth (mastodon, etc.)	10
Antlers (pairs)	9
Photographs, engravings, etc	11

All these specimens are included in the statistics of the entire collection previously given.

For two years past the exhibition series of the Departments of Mammals and Comparative Anatomy, occupying one-eighth the exhibition space of the Museum Building, have been prepared, mounted, classified, arranged and labeled by six persons only. These are the curator of mammals and one assistant, the chief taxidermist and one assistant, the osteological preparator and one assistant. When it is taken into consideration that to mount properly an animal, like a tiger or a deer, or to prepare and mount the skeleton of a whale, a serpent, or a large fish occupied the attention of one person for one or more weeks, it will be conceded that with the present force of preparators the enlargement of the exhibition series can not be very rapid. On the other hand, when it is understood that every specimen (and as two hundred have been received in a single day) has to be entered in the register, with name, locality name of donor and collector, etc., and also in the card catalogue, and be furnished with a number stamped in tin or wood, it will be admitted that a single clerk must necessarily find himself unable to attend to the task of examining, arranging, rebottling, and labeling material already accumulated.

REPORT ON THE DEPARTMENT OF INVERTEBRATE FOSSILS (PALEOZOIC) IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By C. D. WALCOTT, *Honorary Curator.*

The most important addition is the collection of fossils used in the study of the faunas of the Middle Cambrian formations of the United States, from the U. S. Geological Survey. Many of the specimens are types, and 250 are figured on the plates accompanying Bulletin 30 of the U. S. Geological Survey.

The list of the species in this collection is here presented :*

Acc. No.		Specimens.
17447.	*Archæocyathus atlanticus*, Billings	3
	billingsi, Walcott	1
	sp. ?	2
	Ethmophyllum profundum, Billings	4
	rensselæricum, Ford	6
	rarum, Ford	1
	whitneyi, Meek	10
	Leptomitus zittcli, Walcott	5
	Protospongia fenestrata, Salter	9
	Strephochetus ? sp. ?	16
	Sponge ?	1
	Oölitic limestone	1
	Phyllograptus ? *simplex*, Emmons	6
	Eocystites ?? *longidactylus*, Walcott	23
	Eocystites ?	5
	Lingulella ella, H. & W	117
	cælata, Hall, sp	52
	? sp. (Perhaps young of *L. cælata*)	14
	Kutorgina labradorica, Billings	44
	pannula, White (sp.)	17
	prospectensis, Walcott	17
	cingulata, Billings	112
	cingulata ??	1
	———	1
	Acrotreta gemma, Billings	23
	Acrothele subsidua, White	77
	Obolella crassa, Hall, sp. (two casts)	43
	gemma, Billings	7
	nitida, Ford ??	4
	sp. ?	3
	?	1

* Received from the U. S. Geological Survey, through Charles D. Walcott, in charge Division of Paleozoic Invertebrate Paleontology.

Acc. No.		Specimens.
17447.	*Orthis highlandensis*, Walcott	17
	Orthisina fenestrata, Billings	46
	orientalis, Whitfield	3
	transversa, Walcott	13
	sp. ?	6
	Camerella ? antiquata, Billings	1
	Stenotheca elongata, Walcott	6
	rugosa, Hall, sp	23
	n. sp	3
	Scenella conula, Walcott	2
	reticulata, Billings (casts)	6
	retusa, Ford	1
	varians, Walcott	7
	Platyceras primævum, Billings	3
	Fordilla Troyensis, Barrande	25
	Salterella pulchella, Billings	56
	Hyolithes billingsi, Walcott	95
	communis var. *emmonsi*, Ford	14
	communis, Billings	10
	americanus, Billings	44
	princeps, Billings	2
	impar, Ford	14
	sp. ?	11
	sp. ?	2
	?	2
	Hyolithellus micans, Billings	61
	Microdiscus lobatus, Hall, sp	38
	parkeri, Walcott	10
	speciosus, Ford	30
	Mesonacis vermontana, Hall, sp. (nine casts)	13
	Protocaris marshi, Walcott	2
	Leperditia argenta, Walcott	2
	?	4
	Microdiscus sp. ?	1
	Agnostus interstrictus, White	15
	Olenellus iddingsi, Walcott (two casts)	15
	gilberti, Meek (four casts)	136
	asaphoides, Emmons	39
	thompsoni, Hall (five casts)	49
	Bathynotus holopyga, Hall (two casts)	11
	Protypus senectus, Billings (sp.)	59
	hitchcocki, Whitfield (sp.) (casts)	4
	Solenopleura nana, Ford	6
	Anomocare parvum, Walcott	1
	Orycrocephalus primus, Walcott	13
	Crepicephalus liliana, Walcott	48
	augusta, Walcott	72
	Ptychoparia quadrans, H. & W. (sp)	25
	quadrans, H. & W. (sp)	6
	piochensis, Walcott	68
	adamsi, Walcott (two casts)	78
	teucer, Billings	7
	vulcanus, Billings (sp.) (one cast)	8
	kingi, Meek (sp.)	8
	trilineata, Emmons (sp.) (casts)	2

Acc. No.		Specimens.
17447.	*Ptychoparia prospectensis*, Walcott	1
	subcoronata, H. & W. (sp.)	6
	housensis, Walcott	1
	miser, Billings (casts)	7
	sp	1
	Olenoides levis, Walcott	24
	marcoui, Whitfield (three casts)	13
	wahsatchensis, H. & W. (one cast)	7
	quadriceps, H. & W.	23
	expansus, Walcott	1
	spinosus, Walcott	2
	flagricaudus, Whitfield	1
	nevadensis, Meek (sp.)	1
	typicalis, Walcott (three casts)	43
	Bathyuriscus productus, H. & W. (sp.)	122
	howelli, Walcott (one cast)	12
	Asaphiscus wheeleri, Meek (one cast)	49

Forty genera, 100 species, 1 variety, and 2,183 specimens.

Other accessions of importance are:

Acc. No.		Specimens.
16783.	An important accession of 48 species of Cambrian fossils obtained of Dr. G. Lindstrom, of Stockholm, Sweden, by exchange, viz:	
	Anomocare excavatum, Angelin	2
	aculeatum, Ang	1
	acuminatum, Ang	2
	difforme, Ang	4
	limbatum, Ang	4
	Elyx laticeps, Ang	3
	Eurycare angustatum, Ang	1
	camuricorne, Ang	1
	Acerocare ecorne, Ang	1
	Dolichometopus suecicus, Ang	6
	Agnostus aculeatus, Ang	1
	pisiformis, Linnrs	2
	fallax, Linnrs	5
	fissus, Lindgr	5
	glandiformis, Ang	4
	punctuosus, Ang	2
	lævigatus, Dalm	3
	brevifrons, Ang	1
	reticulatus, Ang	1
	atavus, Tull	2
	gibbus, Linnrs	3
	lundgreni, Tull	1
	parvifrons, Linnrs	1
	Olenus truncatus, Brunn	5
	gibbosus, Wahl	4
	Parabolina spinulosa, Ang	2
	Leptoplastus stenotus, Ang	2
	Sphærophthalmus alatus, Ang	2
	Peltura scarabæoides, Wahl	6
	Paradoxides œlandicus, Sjorg	5
	loreni, Ang	4
	tessini, Linnrs. (cast)	1

Acc. No.		Specimens.
16783.	*Solenopleura brachymetopa*, Ang	4
	holometopa, Ang	5
	canaliculata, Ang	5
	Ellipsocephalus polytomus, Linnrs	4
	Leperditia primordialis, Linnrs	1
	Orthis lenticularis, Wahl	3
	exporrecta, Linnrs	2
	Lingulella nathorsti, Linnrs	2
	davisi, McCoy	3
	Acrothele coriacea, Linnrs	5
	Obolus monilifer, Linnrs	2
	Eophyton linneanum, Torell	2
	Arenicolites spiralis, Torell	1
	Cruziana dispar, Linnrs	2
	Medusites lindstromi, Linnrs	5
	favosus, Nath	1

Twenty-three genera, 48 species, and 134 specimens.

The above collection will be of service to students of the Cambrian faunas, as it affords the means of comparison between the Swedish and American faunas.

Another important accession is that given by Mr. G. F. Matthew, of St. John, New Brunswick. It adds materially to the collection of American Cambrian fossils, viz:

Acc. No.		Specimens.
16749.	Cambrian Fossils from the St. John group. From G. F. Matthew, St. John, New Brunswick:	
	Eocystites primævus, Billings	1
	Acrothele matthewi, Hartt	1
	Linnarssonia? miser, Billings	8
	Orthis billingsi, Hartt	4
	Agnostus vir, Matthew	3
	Microdiscus dawsoni, Hartt	1
	Paradoxides eteminicus, Matthew	10
	eteminicus, var. *suricoides*, Matthew	1
	Conocoryphe baileyi. Hartt	4
	baileyi, var. *arcuata*, Matt	3
	(*Bailiella*) *elegans*, Hartt	2
	(*Bailiella*) *walcotti*, Matt	1
	Ctenocephalus (*Hartella*) *matthewi*, Hartt	9
	Ptychoparia orestes, Hattt	1
	orestes, var. *Thyrsites*, Hartt	1
	ouangondiana, Hartt	1
	ouangondiana, var. *aurora*, Ht	1
	robbi, Hartt	1

Ten genera, 14 species, 4 varieties, and 53 specimens.

Acc. No.		
17153.	Exchange collection, received from Mr. G. F. Matthew, St. John, New Brunswick, and containing 9 genera, 11 species, and 3 varieties, as follows:	
	Eocoryne geminum, Matthew	1
	Lingulella linguloides, Matthew	2
	Acrotreta (?) *gulielmi*, Matthew (dorsal)	1
	Kutorgina latourensis, Matt	2

cc. No.		Specimens.
7153.	*Diplotheca caudata*, Matt. (ventral face)	1
	caudata, Matt. (dorsal face)	1
	acadica, var. *sericea*, Matt	4
	Stenotheca acadica, Hartt	1
	Agnostus tessellus, Matt. (head-shield)	2
	tessellus, Matt. (pygidium)	2
	acadicus, var. *declivis*, Matt. (pygidium)	1
	acutilobus, Matt. (head-shield)	1
	acutilobus, Matt. (pygidium)	1
	vir, var. *concinnus*, Matt. (head-shield)	2
	vir, var. *concinnus*, Matt. (pygidium)	2
	Microdiscus pulchellus, Hartt (head)	3
	pulchellus, Hartt (pygidium)	3
	Paradoxides abenacus, Matt. (pygidium)	1
	(fragments of free cheeks)	2
	(fragments of head-shield)	7
	(fragments of pleura)	3
	(hypostoma and doublure)	4
		43

cc. No.

7132. Collection of Lower Cambrian fossils from Cornell University, containing 11 genera, 17 species, and 1 variety, as follows:

Eocystites primævus, Billings (two casts)	6
Lingulella linguloides, Matthew	2
Linnarssonia transversa, Hartt, sp	7
Orthis billingsi, Hartt (two casts)	8
Stenotheca acadica, Hartt, sp. (*Harttia? matthewi?*)	3
acadica, Hartt	1
Agnostus acadicus, Hartt	4
Hyolithes danianus, Matthew	3
Microdiscus pulchellus, Hartt	10
Paradoxides eteminicus, Matthew (two casts)	6
Conocoryphe matthewi, Hartt	4
matthewi, Hartt, sp	6
elegans, Hartt, sp. (two casts)	3
(*Bailiella*) *baileyi*, Hartt, sp	7
Ptychoparia robbi, Hartt, sp	5
orestes, Hartt, sp	5
tener, Hartt, sp. (two casts)	3
ouangondiana, Hartt	5
ouangondiana, var. *aurora*, Hartt	2

The specimens included in accessions 16749, 17132, and 17153 are of value to the Museum collections owing to their being duplicates from the collections of the original investigators of the fauna of the St. John group.

Acc. No.		Specimens.
17230.	From C. L. Webster, State University, Iowa City, Iowa:	
	Devonian fossils:	
	Pachyphyllum woodmani, White	4
	———	1
	Caunopora planulata, Hall	5
	Stromatopora (*Cœnostroma*) *incrustans*, H. & W	2
	Zaphrentis solida, H. & W	45
	Alveolites	16

Acc. No.		Specimens.
17230.	*Fistulipora occidens*, H. & W	12
	Cladopora?	2
	sp?	2
	Crinoid stems	16
	Acervularia inequalis, H. & W	1
	Strophodonta arcuata, Hall	8
	reversa, Hall	10
	canace, H. & W	3
	calvini, Miller?	4
	Orthis impressa, Hall	25
	Streptorhynchus chemungensis, Conrad	1
	Productus hallanus, Walcott	3
	Spirifera cyrtinæformis, H. & W	1
	disjuncta, Sowerby	21
	hungerfordi, Hall	27
	orestes, H. & W	14
	Atrypa reticularis, Linn	35
	aspera, Hall	16
	Cryptonella calvini, H. & W	5
	Platyostoma	2
	Loxonema sp?	3
	Bellerophon	11
	Pleurotomaria sp?	57
	Naticopsis gigantea, Hall	26

Twenty genera, 30 species, and 379 specimens.

The collection from Mr. Webster contains many fine specimens and is a desirable accession.

Acc. No.
17342. From H. C. Powers, Beloit, Wis.:

Trenton fossils:	Specimens.
Buthotrephis succulens, Hall	5
Streptelasma corniculum, Hall	16
Orthis tricenaria, Conrad	9
subquadrata, Conrad	18
Streptorhynchus deflectus, Hall	8
filitextus, Hall	8
Strophomena incrassata, Hall	13
Rhynchospira quadriplicata, Miller	17
Camerella?	55
Cypricardites nicta, Hall	9
ventricosus, Hall	6
rotundatus, Hall	12
Ambonychia lamellosa, Hall	5
Tellinomya ventricosa, Hall	2
Modiolopsis superba, Hall	1
Pterotheca attenuata, Hall	5
Hyolithes baconi, Whitfield	6
Maclurea bigsbyi, Hall	7
Bucania expansa, Hall	2
buelli, Whitfield	5
Bellerophon wisconsensis, Whitfield	9
bilobatus, Sowerby	12

Acc. No.		Specimens.
17342.	*Trochonema beecheri*, Whitfield	6
	beloitensis, Whitfield	11
	Raphistoma lenticulare, Salter	7
	nasoni, Hall	4
	Pleurotomaria subconica, Hall	8
	Holopea? n. sp	1
	Subulites elongatus, Conrad	8
	Murchisonia gracilis, Hall	6
	tricarinata, Hall	8
	helicteras, Salter	11
	Gonioceras occidentalis, Hall	2
	Orthoceras multicameratum, Hall	1
	(*Actinoceras*) *beloitensis*, Whit	6
	Phragmoceras fabulites, Conrad	15
	———	3
	Illænus ovatus, Conrad	9
	Dicellocephalus?	3

Twenty-seven genera, 40 species, and 339 specimens.

Mr. Powers deserves credit for sending a neatly labeled collection of Trenton fossils that contains a good representation of the species named, some of which are very rare and in good condition.

Acc. No.		Specimens.
16684.	From D. S. Deering, Independence, Iowa (November 10, 1885):	
	Silicified coral, probably of the genus *Michelinia*, species unknown	1
16763.	From Frank Burns, U. S. Geological Survey (November 10, 1885):	
	Trenton group, Maury County, Tenn.:	
	Columnaria alveolata, Goldfuss	1
16782.	From H. C. Duvall, Washington, D. C.:	
	Devonian, Charleston, Ind.:	
	Nucleocrinus Verneuili Troost	1
17280.	From W. A. Finkelnburg, Winona, Minn.:	
	Trenton Limestone:	
	Asaphus Barrandi, Hall (cast)	1
	platycephalus, Stokes (cast)	1
	Calymene senaria	1
	Potsdam Sandstone:	
	Ptychoparia (fragments of four species)	4
17379.	From Wiley Britton, Springfield, Mo.:	
	Productus semireticulatus	1
	Spirifera logani	1
——.	An old accession not heretofore recorded (Catalogue Nos. 15054–15078).	
	Stansbury Expedition Collection:	
	Carboniferous fossils:	
	Zaphrentis? multilamellatum, Hall	9
	stansburyi, Hall	5
	Faviphyllum? rugosum, Hall	3
	Productus sp.?	2
	cora, D'Orb	4
	semireticulatus, Martin	2
	Chonetes granulifera, Owen	2

	Specimens.
Spirifera camerata, Martin	2
octoplicata, Sowerby	2
sp.?	1
Retzia radialis, Phillips	2
Athyris subtilita, Hall	14
Tellinomya protensa, Hall	1
Cypricardia occidentalis, Hall	1
Allorisma terminalis, Hall	1
Avicula? curta, Hall	3
Pleurotomaria cornula, Hall	1
Euomphalus subplanus, Hall	2
Streptorhynchus crenistria, Phillips	1
Aviculopecten	1

Fifteen genera, 20 species, and 59 specimens.

This is the Paleozoic portion of the collection studied by Prof. James Hall and reported upon in Stansbury's Expedition to the Great Salt Lake, 1852:

Acc. No.
17366. Collection of the Fortieth Parallel Survey:

Carboniferous fossils:	Specimens.
Archæocidaris	3
Crinoidal columns (four localities)	4
Spongiæ?? (two localities)	2
Zaphrentis stansburyi, Hall	1
Syringopora	1
Fusilina cylindrica, Fischer (three localities)	6
Fenestella (two localities)	3
Bryozoans	1
Discina	4
Chætetes	2
Chonetes	1
granulifera	2
granulifera, Owen	1
Productus cora, D'Orb. (ten localities)	55
nevadensis, Meek? (three localities)	12
——— (seven localities)	17
subaculeatus, Murch	2
multistriatus, Meek (three localities)	12
longispinus, Sowerby	5
punctatus, Martin (two localities)	3
costatus, Sowerby (two localities)	7
costatus var	11
subhorridus, Meek (four localities)	23
Orthis michelini, var. *nevadensis*, Meek	1
Streptorhynchus crenistria, Phillips	3
Spirifera (two localities)	2
Retzia radialis, Phillips	10
Athyris subtilita, Hall (two localities)	4
Athyris?	1
Rhynchonella uta. Marcou	8
Dentalium (two localities)	8

Acc. No.		Specimens.
17366.	*Bellerophon*	4
	carbonarius, Cox ? ? (two localities)	3
	Conularia sp. ?	1
	Aviculopecten (six localities)	13
	sp. ? (two localities)	18
	curto-cardinalis, H. & W	2
	parvulus, H. & W. (two localities)	10
	Edmondia ? (three localities)	3
	Myacites sp. ?	1
	Myalina ?	1
	permiana, Swallow	3
	aviculoides, M. & H	3
	Nuculina bellistriata, Stevens	3
	Sedgwickia concava, M. & H	4
	Schizodus ovatus, M. & H	3
	curtus, M. & H	1
	Pleurophorus ? ?	1
	oblongus, Meek	6

Twenty-seven genera, 49 species, and 318 specimens.

The collections of Paleozoic fossils of the Fortieth Parallel Survey were taken charge of by the writer in 1882, and as his time permitted the material was worked over, identified and recorded. The original field-labels were largely with the specimens, but the identifications made by Messrs. Meek, Hall, and Whitfield were largely lost, except in the case of the figured specimens. The entire collection has now been labelled and turned over to the U. S. National Museum collections, the present accession being the last.

Acc. No.		Specimens
17284.	From the U. S. Geological Survey, through Charles D. Walcott, in charge Division of Paleozoic Invertebrate Paleontology (catalogue Nos. 14999–15053).	
	Carboniferous fossils from Eastern Tennessee:	
	Zaphrentis sp. ?	10
	Streptorhynchus crenistria, Martin	4
	Choncles granulifera, N. & P	1
	Productus semireticulatus, var	28
	semireticulatus, Martin	9
	sp. ?	4
	Spirifera rockymontana, Marcou	15
	(*M.*) *lineata*, Martin	1
	sp. ?	4
	Rhynchonella uta, Marcou	1
	Retzia verneuiliana, Hall	1
	Athyris sp. ?	3
	Terebratula trinuclea, Hall ?	1
	Productus cora ?	1
	Ten genera, 13 species, 1 variety, and 83 specimens.	
	Silurian:	
	Stromatopora sp. ?	1
	Chonetes sp. ?	13
	Orthis sp	2

Acc. No.		Specimens.
17284.	*Rhynchonella* sp.?	50
	Rhynchospira sp.?	1
	Leptocœlia hemispherica, Hall	2
	Aricula rhomboides, Hall	1
	Tellinomya curta, Hall	2
	Beyrichia lata, Vanuxem	21
	Calymene clintoni, Hall	7
	Ten genera, 10 species, and 100 specimens.	
	Lower Silurian (Ordovician):	
	Streptelasma corniculum, Hall	1
	Monticulipora lycoperdon, Say	21
	Escharopora recta, Hall	1
	Leptæna sericea, Sowerby	7
	Strophomena alternata, Conrad	20
	Orthis testudinaria, Dalman	35
	occidentalis, Hall	9
	tricenaria, Conrad	17
	Rhynchonella capax, Conrad	24
	Zygospira recurvirostra, Hall	2
	Cypricardites winchelli, Safford	1
	saffordi, Hall	3
	Murchisonia milleri, Hall	6
	Euomphalus sp.?	1
	Orthoceras arcuoliratum, Hall?	1
	junceum, Hall	3
	Dalmanites sp.?	2
	Cyrtoceras	2
	Fourteen genera, 18 species, and 156 specimens.	
17365.	From the U. S. Geological Survey, through Charles D. Walcott, in charge Division of Paleozoic Invertebrate Paleontology (catalogue Nos. 15148–15165).	
	Carboniferous fossils from Nevada:	
	Athyris subtilita	47
	sp.?	1
	Discina, sp.?	2
	Griffithides, sp.?	2
	Orthis	7
	Pinna	3
	Terebratula hastata, Sowerby	8
	Streptorhynchus crenistria, Phillips	5
	Spirifera (like *S. logani*, Hall)	1
	rockymontana, Marcou	9
	striata, Martin	8
	camerata, Martin	4
	Spiriferina cristata, Schlotheim	2
	Retzia radialis, Phillips	7
	Euomphalus	1
	Twelve genera, 15 species, and 107 specimens.	
17448.	From the U. S. Geological Survey, through Charles D. Walcott, in charge Division of Paleozoic Invertebrate Paleontology.	
	Devonian fossils from Nevada:	
	Rhynchonella sinuata, Hall?	7
	duplicata, Hall	6

No.		Specimens.
8.	*Nucleospira concinna*, Hall	2
	Atrypa reticularis, Linn	32
	Productus shumardianus, Hall	6
	sp. ?	1
	Strophodonta, sp. ?	4
	Orthis impressa, Hall	8
	Lingula (like *L. ligea*, Hall)	5
	Pentamerus Lotis, var. Walcott	45
	Cyrtina hamiltonensis, Hall	1
	———	16
	———	32
	Ambocœlia	8
	Spirifera sp. ?	3
	Athyris, sp. ?	7
	———	2
	———	2
	Holopea ?	3
	Euomphalus, sp. ?	5
	Platystoma lineatum, ? Conrad	1
	Euomphalus (*P.*) *laxus*, Hall ?	2
	Bellerophon	1
	Modiomorpha, ? sp. ?	7
	Leperditia, sp. ?	1
	Orthoceras, sp. ?	1
	Orthoceras ?	5

Nineteen genera, 27 species, 1 variety, and 213 specimens.

his small collection of Devonian fossils is of interest, as it shows extension of the Devonian fauna into southern-central Nevada.

6. From the U. S. Geological Survey, through Charles D. Walcott, in charge Division of Paleozoic Invertebrate Paleontology, 3,500 specimens of fossils from Devonian and Silurian strata of southern Indiana and northern Kentucky. This material has been labeled, with locality and formation, and distributed through the main collection to be studied when reviewing that collection.

WORK ON COLLECTIONS.

he direct work on the collections of the Museum has been the ording, identifying, and labeling of the material mentioned under cessions," and a continuation, as opportunity offered, of the arrange- nt of the old collections of the Smithsonian Institution. The latter rk has been very limited, owing to the writer's position as paleontolo- t in charge of the paleozoic paleontology of the U. S. Geological rvey, requiring him and his assistants to devote the most of their e to original work in connection with the Survey. This work will, a large degree, inure to the benefit of the Museum collections, as the terial studied contains many new types and large numbers of species

illustrating the stratigraphic and geographic distribution of life during paleozoic time.

There is at present quite a large amount of material transferred from the Geological Survey that can be placed on exhibition as soon as cases are prepared to receive it.

A list of the publications which appeared during the year, and which were based on material in the collection, will be found in Part IV.

The systematic collection of Cambrian fossils, commenced in 1884, together with the formation of a collection of material from the typical localities of Lower Silurian and Devonian fossils, has advanced, and large collections have been made as the means available permitted. If this can be continued, there is, in the near future, the prospect of large increase to the collections of the Museum. The direct field-work of the geologists of the Geological Survey will also add to the collection as soon as the material is studied and turned over to the Museum.

Other sources of increase will be from the accessions by exchange and the contributions made by individuals. I think the latter source of increase will enlarge when a portion of the collection is placed on exhibition and parties interested know that attention will be given to the care of their contributions.

With all of the above, there is still a source of increase that can only be made available by the use of a collecting and purchasing fund. There are localities that can not be properly visited and collections made by the officers of the Geological Survey. On the northern border of the United States, in Canada, New Brunswick, and even in Newfoundland, it is essential that collections should be obtained for comparative study.

It frequently occurs that individuals who have given years to collecting in some locality desire to sell their collections at a relatively small cost as compared with the expense of collecting. When such collections will fill gaps in the collections of the Museum it is very desirable, if the Museum is to take a high position in this department, that they should be secured.

The American Museum of Natural History, in New York City paid $65,000 for the Hall collection, and the Museum of Comparative Zoology of Cambridge, Mass., has purchased large collections of Paleozoic fossils. The National Museum does not need to make such large outlays of money, but a comparatively small sum, available each year, would, with other sources of increase, give a collection worthy of the Museum.

The collections are now arranged in sixteen table cases in the southeast court of the Museum. With the exception of writing out the labels in four of the cases, and the addition of the material from accessions, no changes have been made since the last annual report of this department was submitted. The number of specimens was given then as follows:

	Specimens.
Cambrian	10,848
Silurian	12,418
Devonian	13,548
Carboniferous	33,688
Permian	1,892
Green's casts (plaster)	255
Total	72,649

To this must be added the accessions of the past year, 7,833 specimens. The last number entered in the catalogue in June, 1885, was 14850, and in June, 1886, 15460.

REPORT ON THE DEPARTMENT OF INVERTEBRATE FOSSILS (MESOZOIC) IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By C. A. WHITE, *Honorary Curator.*

The principal additions which have been made to the collections of Mesozoic invertebrates during the past year are those which have been sent to the Museum by the U. S. Geological Survey. Only a small part of these have been registered in the records of the Museum; all the others having been cleansed, ticketed, and placed in cases in the north balcony of the Smithsonian Building. Our records show that eight accessions have been received through the Museum, all but two of which are small and unimportant. One of these is a small lot of Cretaceous fossils from Mexico, all new species, the gift of Señor José G. Aguilera, of the Mexican Geographical and Exploring Commission.

The other is a collection of about two hundred specimens, representing about seventy species, from M. Charpy, Director of the Museum at Annecy, Haute-Savoy, France. They are of Jurassic and lower Cretaceous age.

The work of arranging and classifying the collections of the Museum has progressed during the year, and has reached a condition in which the collections are all accessible for convenient study, but nothing has been done with reference to their installation, or their separation into reserve, exhibition and exchange series.

The work of arranging and classifying has embraced the numerous collections which have been for many years in possession of the Museum, some of which had been damaged and their labels destroyed by the fire which occurred in the Smithsonian Building many years ago.

To identify and arrange these collections has required much labor. Each specimen has undergone the process of identification, cleansing, recording upon the Museum register, being numbered in paint, labelled, and finally arranged in trays, drawers, and cases suitable for convenient reference. All of this has been done, as far as possible, in accordance with the prescribed usages of the Museum, but often, in the absence of precedent, it has been found necessary to devise new methods of arrangement.

The arrangement in cases has been made as follows: All collections whose entirety had not been broken, or the specimens identified and labelled, were transferred to the north balcony of the Smithsonian Building and there arranged according to locality. To the collections of the U. S. Geological Survey a green tag was glued upon each specimen, bearing the accession number of the Survey. All the collections were arranged in cases geographically and a card index made, by which every collection can be readily referred to.

The second class of collections embraced all specimens that had been identified and duly recorded on the Museum register and labelled in the proper manner. The temporary arrangement of this material in the southeast court of the Museum has been completed.

The present provisional arrangement is purely stratigraphical; only a broad biological classification having been attempted under each geological period.

The many valuable type specimens belonging to the collection have been arranged separately from the stratigraphical arrangement above mentioned, so that they can be conveniently studied as a whole. These have been collected together and reidentified by Mr. Marcou, who has published a catalogue of the same in the proceedings of the Museum.*

During the year, 1563 entries were made in the Museum catalogue.

No estimate has been made of the total number of specimens in the Museum collections, nor any attempt to group them into different categories.

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* Vol. VIII, pp. 290–344.

REPORT ON THE DEPARTMENT OF FOSSIL PLANTS IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By LESTER F. WARD, *Honorary Curator.*

Comparatively few additions have been made to the collection during the year, the most important being a series of 33 species (93 specimens), presented by Mrs. H. C. Beckwith. Most of the specimens in this donation were collected by Rev. A. Lakes in the vicinity of Morrison, Colo., the rest from Golden, Colo.

The other additions consist of specimens sent by the various correspondents of the Institution for identification.

The routine work in the department has been confined to caring for the specimens as they have been received, and in boxing up and sending for determination the large mass of material, which has been accumulating for many years.

In September, 1885, ten boxes of miscellaneous material were sent to Prof. Leo Lesquereux, of Columbus, Ohio, for identification. This material has been accumulating since the founding of the Smithsonian Institution, and had become of such magnitude that the question of space was a serious one. In working up this material Professor Lesquereux has found much that is incapable of satisfactory determination, and such has been discarded. On the last of May, 1886, these specimens were returned to the Museum, all carefully labeled. From this material Professor Lesquereux was able to determine about 150 species, of which number 107 species were new to the collection and 14 new to science.

PRESENT STATE OF THE COLLECTION.

(1) Total number of specimens of catalogued material (exclusive of my recent collection still in hand for study)		7,439
(2) Number of specimens not specifically identified (mostly fossil wood)		1,713
(3) Determined material		5,613
(4) Number of specimens discarded		113
(5) Duplicates now stored in the Armory Building		1,091
(6) Number of distinct species identified, catalogued, and installed:		
Paleozoic	330	
Mesozoic	194	
Cenozoic	548	
		1,072

REPORT ON THE DEPARTMENT OF RECENT PLANTS IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By LESTER F. WARD, *Honorary Curator.*

The largest and most valuable addition to the collection was presented by Dr. V. Havard, U. S. Army. This collection, from Texas and the Southwest generally, contains many species new to the herbarium and also some new to science which have recently been described by Dr. Asa Gray and Mr. Sereno Watson. Quite a number are species detected for the first time within the limits of the United States. The collection is particularly rich in *Compositæ*, *Gramineæ*, and ferns.

Next in importance is the collection of about 1,000 species, presented by Mr. William M. Canby, of Wilmington, Del., which is also rich in western plants, particularly from California. This with the Havard donation added over 1,500 species to the herbarium.

A fine collection of nearly 350 species from the Yellowstone National Park was donated by Mr. Frank Tweedy. These specimens are doubly valuable as they were used by Mr. Tweedy in the preparation of his "Flora of the Yellowstone National Park," recently issued (Washington, 1886).

Mr. C. G. Pringle has presented a set of his Plantæ Mexicanæ collected in Mexico in 1885, most of which are new to the herbarium.

Dr. Edward Palmer has also donated a set of the plants collected by himself in southwestern Chihuahua in 1885. More than 20 per cent of the collection consists of species new to science.

Mr. Gerald McCarthy donated nearly a complete set, about 300 species, of his North Carolina collection of 1885. This distribution is rich in grasses and sedges.

Besides the above donations there have been many others, of varying size, from nearly all parts of the country, which fact goes to prove that when the existence of the herbarium becomes more widely known the influx of material will be rapid.

Nearly two months of the first part of the fiscal year were spent in completing the card-catalogue of the Joad collection. This collection consisted of about 10,000 species, 9,000 of which were new to the herb-

arium, for which cards had to be written. In the matter of practical working, this card-catalogue is found to be of great value, since by consulting it the presence or absence of any species may be at once determined without the necessity of going to the cases. This is believed to be the only large herbarium in this country in which this system has been adopted, and the labor of keeping it up will be very slight compared with what it would be to prepare such a catalogue after the accumulation of a great mass of material. No species is considered as belonging to the collection until its card has first been written and entered. Besides convenience of consultation, this system possesses another point of advantage in that it furnishes the source of a record, easily accessible, of the exact status and magnitude of the collections, a matter which is open to much speculation when no such data are at hand.

The poisoning of specimens newly received has occupied much time. About 5,000 specimens have been permanently protected from the ravages of insects. A complete immersion of the specimen in a saturated alcoholic solution of corrosive sublimate has been found most efficacious.

The work which has required the largest amount of time has been the selection of material for mounting. Instead of mounting indiscriminately the mass of duplicate material which constantly comes to a collection of this character, a careful comparison is always made in order to be certain that the specimens will actually add to the ones already in hand; either a different phase of the plant or a new and interesting locality. In this manner pure duplication is checked and the growth of the herbarium made to accommodate itself, as nearly as possible, to the present somewhat restricted space. As rapidly as the specimens selected can be mounted they are added in their systematic place to the herbarium, so that no large amount of this new material is allowed to accumulate and remain inaccessible.

In compliance with your circular issued March 1, 1883, much work has been done towards perfecting a list of the cultivated plants of the District of Columbia. Most of the time of Mr. A. L. Schott, when not engaged in caring for the living plants in the Museum, has been spent in making extensive collections about the city. Several thousand specimens are the result of this labor. These have all been poisoned and await final identification, which we hope soon to have time to undertake. A slip catalogue of those already determined has been commenced and now contains about 1,800 slips. As the estimated number of cultivated species is about 4,000, much work yet remains to be done.

In regard to the exhibition and study series nothing has as yet been attempted, although a large mass of material, principally woods, fruits, fruit vessels, etc., has accumulated. It is to be hoped that at no distant day an exhibition of this character may be undertaken, since from an educational point of view it would undoubtedly be of great value. When once begun its growth will be rapid, since by seeing unique vege-

table products the general public will be stimulated to give material which is now allowed to be wasted.

The research work has been confined in the main to the identification of material that has been sent for determination by its correspondents, or has in other ways become the property of the department. When the routine work of installing the collections now in hand is completed it is hoped that more extended researches may be undertaken.

According to the record furnished by the card-catalogue, there are now in the herbarium and accessible 15,538 species of plants. Of the actual number of specimens it is impossible to state, but 30,000 may be taken as a safe estimate, as it is less than an average of two to each species. It is also impossible to give the exact number of duplicates for distribution or exchange, but there are probably from 5,000 to 8,000 specimens.

The last entry in the Museum catalogue on June 30, 1885, was 23, and the last on June 30, 1886, was 63, making a total of 40 entries during the year.

REPORT ON THE DEPARTMENT OF MINERALS IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By F. W. CLARKE, *Honorary Curator.*

The accessions have been numerous, both by gift and exchange, and have covered a wide range of species. Of the gifts the following have been among the more important:

From Charles F. Brown, 35 specimens of quartz, wavellite, rutile, etc., from Arkansas.
From F. W. Taylor, a series of the vanadates from Lake Valley, New Mexico.
From Prof. N. H. Winchell, thomsonites, etc., from Minnesota.
From Prof. R. Ellsworth Call, large calcites, from Moline, Ill.
From Maj. J. W. Powell, a full series of the turquoises of New Mexico.
From the West Prussian Provincial Museum at Danzig, 15 inclusions in amber.

Of our exchanges the more noteworthy accessions have been as follows:

From W. J. Knowlton, 138 specimens of annite, cryophyllite, danalite, etc., from Rockport, Mass.
From N. P. Pratt, a collection of corundums from Georgia.
From Prof. Archibald Liversidge, 64 specimens of Australian minerals.
From the Musée d'Annecy, 70 specimens of minerals, mostly French.
From the Ecole des Mines at Paris, 44 specimens.
From James Matters, a series of minerals from the French Creek Mine in Pennsylvania.
From Prof. B. K. Emerson, of Amherst College, 56 specimens, miscellaneous.

The foregoing entries are but a few out of many, and refer to the mineral collection proper. The subcollections of gems and of meteorites, however, have been proportionally enriched, as the subjoined examples show.

METEORITES.

From Dr. J. Berrien Lindsley, 10 specimens of meteorites by gift.
From G. F. Kunz, a fine slice of the Glorieta meteorite in exchange.
From Prof. C. U. Shepard, 17 specimens of meteorites in exchange.
From S. C. H. Bailey, 3 specimens of meteorites in exchange.
From the Academy of Natural Sciences, Philadelphia, a slice of a Tennessee meteorite.

GEMS AND ORNAMENTAL STONES.

From G. F. Kunz, by gift, 3 Brazilian tourmalines
From Dr. D. B. McCartee, by gift, an "inkstone holder" of Chinese jade, mounted on a carved teakwood base.

From Prof. G. B. Goode, on deposit, a carved agalmatolite plate.

From the New Orleans Exposition, through the Department of State, a series of Persian turquoises.

From Thomas Donaldson, esq., on deposit, a fine series, polished, of the New Mexican turquoise.

By purchase, a collection of nearly a thousand examples of the crystallized quartz from near Hot Springs, Ark., was also acquired.

The routine work of the department, in addition to the usual details of cataloguing, labeling, etc., has involved much labor in the identification of species, completing exchanges, preparing and shipping sets of minerals to schools and colleges, and correspondence. Furthermore, great progress has been made in mounting the collection for exhibition, and in the final distribution of the material into Museum and duplicate series. In the latter connection the entire collection has been thoroughly gone over and permanently classified. The final result of this classification may be stated numerically so as to show the actual extent of the collection on July 1, 1886:

	Specimens.
On exhibition, Museum series	3,238
On exhibition, Willcox collection, deposited	1,229
Reserve or study series	5,404
Duplicates	8,530
Total	18,401

The number of the last catalogue entry in June, 1885, was 45,843, and that of the last catalogue entry in June, 1886, was 46,615, giving a total of 772 entries during the year.

These figures require a few words of explanation, particularly as regards the policy of the department. The exhibition series naturally consists of the larger and showier specimens, and specimens having a general public interest. But in every collection of minerals there are many objects having purely scientific value, which could not be publicly displayed without using an unwarrantably large amount of space. Such specimens form our reserve or study series, and are preserved in drawers underneath the regular show cases. This series is intended, so far as possible, to be monographic and exhaustive, so that it may be of use to mineralogists, who wish to make comparative studies of similar minerals from widely separated localities; and much material finds a place in it, which has value only on account of its origin or associations. Some scientific work has been done on portions of the collection incidentally to my duties as chief chemist of the U. S. Geological Survey. For example, I have worked up the minerals from Litchfield, Me., and the turquoise from New Mexico, and Mr. R. B. Riggs has made full analyses of the lepidolites from Maine and the cryophyllite and annite of Rockport, Mass. A full description of the gem collection, by Mr. G. F. Kunz, appeared in the Popular Science Monthly for April, 1886. The latter paper, brought down to date and revised, is reproduced in Part III of this report.

REPORT ON THE DEPARTMENT OF LITHOLOGY AND PHYSICAL GEOLOGY IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By GEORGE P. MERRILL, *Curator.*

The additions to the collections during the year covered by this report have been nearly all in the form of small accessions from a great variety of sources, and but few of them were of sufficient importance to merit special mention. As heretofore, the department has had to rely for its material mainly on exchanges and donations, and while much of the matter thus obtained is valuable, it is for the most part of a very miscellaneous character.

The more important of the accessions are given in the following list:

Abbott, A. N. A series of fulgurite tubes from Union Grove, Ill.

American Institute of Mining Engineers. Ninety-five samples native and foreign building stone.

Bernadou, Ensign J. B. One slab Verdantique marble, one stone pencil jar, one disk of yellow stone, and one box of indurated talc. (?) Corea.

Biddle, Henry J. A collection of serpentines and associated rocks from Chester County, Pa.

Bouré, T. T. Specimens eruptive rocks from Hingham, Mass.

Charpy, M. L. (Museum of Annecy, Haute Savoy, France). A collection of 154 rocks from France, Italy, Belgium, and Hungary.

Crittenden, A. R. Travertine. Rock of Gibraltar.

Crosby, Prof. W. O. Collection of rocks and minerals, various sources.

Diller, J. S. Six specimens eruptive rocks from Kentucky and California. Also photograph of a cliff of banded hypersthene andesite. California.

Dugger, S. M. One specimen flexible sandstone, Banner's Elk, Watauga, County, N. C.

Emerson, Prof. B. K. A collection of some 50 specimens Massachusetts rocks and small slabs of Suisin City (California) "Marble."

Fritsch, E. Six samples Algerian marbles.

Georgia Marble Company. Twelve cubes, 6 thin slabs, and 1 small column of marble from Pickens County, Ga.

Gurney, H. D. One large block red granite from Watab, Minn.

Hill. R. T. Volcanic dust from near Wray Station, Colo.

Hitchcock, Prof. C. H. A collection of over 100 specimens rocks from New Hampshire, and a vertical column showing the proportional thickness of the Archæan, Cambrian, and Silurian rocks in New Hampshire.

Horan, Henry. Slab of stalagmite marble from the Luray Caves, Virginia.

Lamb, T. F. Elæolite Syenite from Litchfield, Me.

McIlhenney, Dr. W. S. Two specimens soapstone from the District of Columbia

Merrill, G. P. Collection of serpentine from Hoboken, N. J. Basalt from coast of Ireland. Rocks from Auburn, Lewiston, and Minot, Me.

Mexican Geographical Exploring Commission. One hundred and fifty specimens rocks and building stones of Mexico, including a fine series of the celebrated "Mexican onyx."

Mississippi State Commissioners to the New Orleans Exposition. Three samples building stone from Mississippi.

New Orleans Exposition. One large concretion and one large block of volcanic breccia.

O'Leary, Dennis. Specimens from the memorial stones sent from Germany, Japan, Brazil, Cherokee Nation, Maryland, and Massachusetts for the Washington Monument.

Peale, Dr. A. C. Volcanic dust from Kansas and Montana; one sandstone and one pyrite concretion, Montana.

Purchased. Three samples Mexican onyx cut in form of paper knife and paper weights.

Rice, Prof. William North. A collection of 30 rocks and shells from Bermuda.

Roesber, F. E. Two samples building stone and one grindstone from Texas.

Sayles, Ira. A series of weathered limestones, concretions, and stalagmitic deposits, Tennessee.

Shepherd, A. R. Two specimens stalactites from Botopila, Mexico.

South Carolina Commissioners to the New Orleans Exposition. Twelve samples building stones from South Carolina.

State Department. Fifty-three samples building stone from Nova Scotia and New Brunswick.

Stejneger, Dr. L. A collection of some 40 specimens rocks from Copper and Behring's Islands.

Swiss Centennial Commission 1876. Eighty specimen rocks from the St. Gothard Tunnel.

Trigg, J. S. Six small pieces and one large slab "Madrepore" marble, Charles City, Iowa.

True, F. W. Collection of rocks from Loudoun County, Va.

Turner, L. M. Collection of rocks from Ungava, Labrador.

Wadsworth, Dr. M. E. Volcanic dust from Dakota.

Ward and Howell. One large slab of limestone with glacial markings, from Rochester, N. Y.

Williams, Dr. George H. A collection of 25 native and foreign rocks.

Winchell, Prof. N. H. Fifty pounds catlinite, from Pipestone County, Minn.

U. S. Geological Survey. Twelve relief maps, including models of Mount Taylor, New Mexico; Washoe District, Nevada; Eureka District, Nevada; Uinta and Wasatch Mountains, Utah; Leadville and vicinity, Colorado: The same in sections; High Plateaus of Utah; Henry Mountains, Utah; Stereogram of the Henry Mountains, Utah; Elk Mountains, Colorado; Yosemite Valley California; and the Yellowstone National Park.

The preparation of the Jesup collection of building stones for the American Museum in New York City, of which mention was made in my report for the six months ending June 30, 1885, consumed a large portion of the time up to January 1. This work was completed at about the date noted, and the collection is now packed and awaiting shipment. It comprises some 1,073 samples in the form of 4 inch cubes and 1,000 thin sections for microscopic study. All the leading quarries in the country are represented, and next to our own this may be considered the most complete and systematic collection of its kind in the United States. What time was not taken up by this work has been

fully occupied in identifying and arranging the materials comprising the various collections intended to form a part of the reserve series. Particular attention has been given to the preparation of the exhibition series, but owing to lack of some very essential materials and an insufficient number of proper cases, the collections of rock-forming materials, the structural series, lithological series, and the building and ornamental stones only are in conditions approximating completion. In Part III of this report will be found a catalogue of the building stone collection, so annotated and arranged as to constitute a provisional handbook. There are now in process of preparation the three exhibition series classed under the heads of Dynamical, Structural, and Historical Geology. A portion of the materials belonging to these series are already on exhibition, being of themselves sufficiently striking in appearance to excite interest, though not occupying their proper places in the systematic collection.

Some two hundred thin sections of rocks have been added to the Museum collections during the year, being prepared in large part by Mr. L. H. Merrill.

I regret being obliged to state that no progress has been made in the matter of labeling during the entire period covered by this report. Labels have been written but if printed at all the work has been done in such a manner as to render the results valueless, and to necessitate what will amount practically to rewriting the entire copy. It is needless to say, that so far as this department is concerned, the present methods of printing (whereby the curator receives no proof-sheets) are extremely unsatisfactory.

Eight series of duplicates, comprising 292 specimens, have been sent out during the year in the way of exchanges. To this list should also be added the building-stone collection already noted, which although not as yet shipped is in complete readiness.

The working force of the department was largest during the early part of the year, owing to the extra work entailed in the preparation of the Jessup collection of building stone. It has been as follows:

For the three months ending October 1, two stone-cutters and one stone-polisher; for the four months ending October 31, one laborer; for the six months ending December 31, one section-cutter and general assistant, Mr. L. H. Merrill; for the entire year one lady clerk, Miss B. Frankland. Since March, Mr. E. S. Lewis has satisfactorily filled the position of volunteer assistant, and one laborer has been detailed to work in the department when not required for special duties elsewhere.

The total number of entries upon the department catalogue during the year has been 1,021, comprising some 1,276 specimens of various kinds.

Pressure of routine work in the past, as in preceding years, has precluded the devotion of much time to original work with a view to publication. This together with the fact that such of my time as could be

spared has been devoted to papers of considerable length, and which are as yet incomplete, cuts down the possible list to two titles, as given in the bibliography.*

The collections are not as yet sufficiently systematized to afford good facilities for study to other than Museum officials, and, although they have frequently been consulted for purpose of comparison, nothing, other than above, has been published regarding them so far as I am aware.

The present state of the collection is as follows:

Whole number of rock specimens in the reserve series	17,647
Whole number of rock specimens in the duplicate series	3,000
Total	20,647

Of the reserve series 5,313 are now on exhibition; of these 2,730 are building and ornamental stones, and 1,829 belong to the educational series of rocks and rock-forming minerals. The remainder are miscellaneous materials, not yet in their proper places in the series of which they are to form a part. There are also now in the collection some 3,400 thin sections of rocks for microscopic study.

The rocks of the reserve series not designated or as yet not utilized for exhibition, but which are stored in the drawers of table cases, number some 12,203. This number may be reduced somewhat by the withdrawal, from time to time, of materials to make up the exhibition series. They may be summarized as follows:

	Specimens.
From the various geological horizons of Canada, New Brunswick, and Nova Scotia	851
From Victoria, Australia	355
From the United States Geological Surveys west of the 100th meridian	568
From the United States Geological exploration of the 40th parallel	2,640
From Leadville, Colorado, S. F. Emmons, United States Geological Survey	588
From the Comstock Ledge and Washoe districts, Nevada, G. F. Becker, United States Geological Survey	198
From St. Gothard Tunnel	80
Rocks of New Hampshire	250
Miscellaneous, classified by kinds	2,527
Other miscellaneous	4,143
Total	12,203

Aside from the rocks mentioned above as forming a part of the systematic series, there are now on exhibition the following objects of interest which were in part noted in my report for 1884: One slope table case of lavas from Ice Spring Buttes, Utah; one slope table case of tufas from Lake Lahontan, Nevada; one slope table case of siliceous and calcareous sinters from the Yellowstone National Park; one door-screen case of concretions; one pier case of stalagmites and stalactites, and one pier case devoted to collections illustrating the geology of Bermuda; this collection is not yet complete. There are also sundry interesting specimens

* See Part IV.

showing glaciation, sand erosion, ripple marks, and mud cracks, but which need not be mentioned more in detail since they do not as yet occupy their proper places in the systematic exhibits.

Other miscellaneous materials on exhibition are mentioned in the following list: Eight geological maps of the United States and foreign countries; one large map showing distribution of temperature in the United States for the months of June, July, and August; one large map showing distribution of rain-fall for the same period; one large map showing distribution of rain-fall for the months of December, January and February; fifteen astronomical views comprising the Trouvelot series of astronomical drawings; twenty-three photographs of stone quarries; eight colored photographs of stone buildings; fifteen geological views, including the large plates from Dutton's atlas of the Grand Cañon of the Colorado of the West; seventeen models, or relief maps. These last are given in detail below:

I. Yellowstone National Park. Scale, 1 inch=1 mile; horizontal and vertical the same. Modeled by E. E. Howell. Issued by Ward & Howell. Size, 4 feet 7½ inches by 5 feet 5½ inches. U. S. Geological Survey.

II. Elk Mountains of Colorado. Scale: horizontal, 1 inch=1 mile; vertical, 1 inch=2,640 feet. Modeled by W. H. Holmes. Size, 2 feet 2 inches by 3 feet 8 inches. U. S. Geological Survey.

III. Mount Vesuvius and Monte Somma, Italy. Compiled by Thomas Dickert. Size, 2 feet 4½ inches by 2 feet 4½ inches. Issued by Ward & Howell.

IV. Geological model of Switzerland. Size, 11 inches by 24 inches.

V. The Washoe District, Nevada. Scale, 1 inch=1,666 feet or 1:20000; horizontal and vertical the same. Geology by G. F. Becker. Modeled by E. E. Howell. Size, 2 feet 5½ inches by 3 feet 3 inches. Issued by Ward & Howell. U. S. Geological Survey.

VI. Leadville, Colo., and vicinity. Scale, 1 inch=800 feet, or 1:9600. Geology by S. F. Emmons; modeled by E. E. Howell. Size, 2 feet 7½ inches. Issued by Ward & Howell. U. S. Geological Survey.

VII. The same in sections. U. S. Geological Survey.

VIII. Gulf of Mexico. Scale: vertical, 1 inch=1,000 fathoms; ratio of vertical to horizontal, 0.03. Size, 23 by 32 inches. Issued by Coast and Geodetic Survey.

IX. The Yosemite Valley, California. Scale, about 4 inches to 1 mile. Horizontal and vertical the same. Modeled by E. E. Howell from survey by King and Gardner. Size, 2 feet 5 inches by 4 feet one-half inch. Issued by Ward & Howell. U. S. Geological Survey.

X. The San Juan Mountains and mining regions. Scale, 1 inch=1 mile, or 1:63360; vertical scale three times the horizontal. Modeled by T. W. Eglostein. Size, 4½ by 3½ inches. U. S. Geological Survey, Capt. George M. Wheeler in charge.

XI. The Grand Cañon of the Colorado of the West and Cliffs of

Southern Utah. Scale: vertical, 1 inch=5,000 feet; horizontal, 1 inch=2 miles. Modeled by E. E. Howell. Size, 6 feet 6 inches by 6 feet 7 inches. Issued by Ward and Howell. U. S. Geological Survey.

XII. Eureka District, Nevada. Scale, 1 inch=1,600 feet, or 1:19200; horizontal and vertical the same. Geology by Arnold Hague; modeled by E. E. Howell. Size, 5 feet 2 inches by 5 feet 6½ inches. Issued by Ward and Howell. U. S. Geological Survey.

XIII. Uintah and Wasatch Mountains. Scale: vertical, 1:126720; horizontal, 1 inch=4 miles, or 1:253440. Modeled by E. E. Howell. Size, 4 feet 3½ inches by 4 feet 5½ inches. Issued by Ward and Howell. U. S. Geological Survey.

XIV. Mount Taylor, New Mexico. Scale, 1 inch=1 mile; horizontal and vertical the same. Geology by C. E. Dutton; modeled by E. E. Howell. Size, 4 feet 3½ inches by 4 feet 3½ inches. Issued by Ward and Howell. U. S. Geological Survey.

XV. Henry Mountains, Utah. Scale, vertical and horizontal the same. Geology and modeled by G. K. Gilbert. Size, 3 feet 10½ inches by 5 feet 2½ inches. Issued by Ward and Howell. U. S. Geological Survey.

XVI. Stereogram of the Henry Mountains, Utah, showing the form the country would have if the eroded portion to the top of the cretaceous were restored. Vertical and horizontal scale the same. Geology by G. K. Gilbert. Size, 3 feet 10½ inches by 5 feet 3½ inches. Issued by Ward and Howell. U. S. Geological Survey.

XVII. High Plateaus of Utah. Vertical and horizontal scale the same. Modeled by C. E. Dutton. Size, 4 feet 9 inches by 4 feet 10 inches. Issued by Ward and Howell. U. S. Geological Survey.

REPORT ON THE DEPARTMENT OF METALLURGY AND ECONOMIC GEOLOGY IN THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

By Fred. P. Dewey, *Curator.*

During the year 175 accessions were received. Of these, 42 were collections gathered by the curator at the New Orleans Exposition, which were fully described in the last annual report, but which were not received in Washington in time to be accessioned until after the first of July, 1885. Of the remaining 133 accessions a very large number were specimens sent in for examination and report, and have no value whatever to the Museum. Only 7 of the accessions are of sufficient importance to be especially mentioned. These are:

A small but very interesting and valuable collection representing the occurrence and associates of iridosmine, presented by Mr. A. D. Walcott, Randolph, Oregon. A small collection representing the occurrence of free silver in the Batopilas region of Mexico, collected by Dr. Edward Palmer, of the Smithsonian Institution. A small collection representing the application of the Russell leaching process for the extraction of the precious metals as applied to the ores of Lake Valley, New Mexico, presented by Mr. F. W. Taylor. A very full and interesting illustration of the occurrence, extraction, and uses of aluminum, presented by Col. William Frishmuth, Philadelphia, Pa. A full series of photographs of microscopic sections of iron and steel, presented by Mr. F. L. Garrison, Philadelphia, Pa. A series of English cokes from various localities and representing different processes of manufacture, presented by Mr. Henry Simon, Manchester, England. The very large collection presented to the Museum by the American Institute of Mining Engineers. This collection is especially rich in illustrations of the American iron industry, the ores of Missouri, and of foreign ores and metallurgical processes; it will be more fully described in the historical sketch of the department.

In cataloguing the collections, 5,506 entries, covering 8,233 specimens, have been made. Besides the 175 accessions received during the year. 29 accessions, previously received, have been entered. This material may be divided as follows: From the New Orleans Exposition, 76 accessions, 2,422 entries, and 3,233 specimens; American Institute of Mining Engineers, 1 accession, 2,616 entries, and 4,236 specimens; miscellaneous, 127 accessions, 468 entries, and 764 specimens.

In the card-catalogue 1,638 entries have been made, and in this connection Mr. H. J. Biddle kindly volunteered assistance and examined a large series of ores from Mexico, from Missouri, and from the New Orleans Exposition, making 2,400 determinations of mineral species in the specimens.

One hundred and seventy-seven specimens have been sent out in exchange, 59 reports upon material submitted for examination, and 11 special reports of information have been made.

This is the first year since the organization of the department that there has been any serious attempt at systematic installation of the collections. Upon the receipt of the American Institute of Mining Engineers' collection a portion of the west hall was assigned for its exhibition, but owing to the incompletness of the records of the material and to the fact that, while many of the individual collections were quite full and complete, there were many large gaps in the collection as a whole, which rendered its installation in the west hall unadvisable, it was found necessary to delay the exhibition of much of the material, and instead it was decided to install the systematic collections, the basis of which had been exhibited at the New Orleans Exhibition, using as much of the Institute collections as were in proper shape.

A large portion of the year has been devoted to unpacking, examining, rearranging, and adding to the New Orleans material, so as to complete as far as possible the metallurgical collection. Aside from the arrangement of the material, considerable time has been consumed in preparing general labels for the collections.

In addition to the papers noticed in the Bibliography (Part IV) as published by the curator, there is also included a notice of a paper by Mr. F. L. Garrison, of Philadelphia, describing the photographs of microscopic sections of iron and steel, copies of which have been presented to the Museum.

Early in 1884 the attention of the department was turned towards the necessity of an examination of the fuel values of American coals, and in the latter part of the year the results of a careful examination of the subject, together with plans for a suitable investigation, were formally laid before the Director, with the object of bringing the matter before Congress in order to secure the necessary appropriations to carry on the work.

The question of the relative fuel value of different coals is one of great importance to all users of coals, and on this account alone the subject is one that should command the attention of the Government; but aside from this, the Government has a direct pecuniary interest in knowing the value of different coals purchased for its own use. This was appreciated as long ago as 1841, when an appropriation was made to enable a series of experiments to be made to determine the steaming power of various coals furnished for the Navy.

The examination carried on under the provisions of this appropriation

for the Navy by Prof. W. R. Johnson, from 1841 to 1844, was the first attempt to systematically investigate American coals.

During the years 1879, 1880, 1881, and 1882 a series of experiments to determine the fuel value of various materials furnished to the U. S. Army was carried on by the Quartermaster-General of the Army, General M. C. Meigs, which included many American coals.

Besides these two systematic investigations a few examinations of coals from restricted areas have been made from time to time by the Government, especially by engineers in the Navy. Many of these tests, however, were undertaken to determine the efficiency of boilers, and are only incidentally tests of coal.

Aside from these investigations by the Government scarcely anything has been done in this line, although occasionally boiler tests have been made by private parties. While these results are interesting and of use, yet the conditions of the tests were so variable that the results can not possibly be connected so as to give relative results of any accuracy, and therefore can not be used to determine the relative fuel value of the coals tested.

The experiments by Professor Johnson embraced very careful and elaborate tests of the steaming power of the coals, together with chemical analyses and some few other tests. Considering the time when it was made and the condition of experimental science at that period, this examination was a remarkably thorough and complete one, and the results obtained were of great value to the Navy.

The experiments by General Meigs were restricted to the determination of the fuel value of the materials tested as compared with the standard of the Army—a cord of oak wood—and can not be considered as a systematic investigation of coal, so that really the only complete examination of American coals is that of Professor Johnson, and for want of better and more recent figures it is still the standard of reference.

The number of coals upon the market at that time was very small, and his series embraced only forty-one mines, of which six were foreign. The thirty-five American coals were about equally divided between the Pennsylvania anthracite, the Pennsylvania and Maryland bituminous, and the Richmond, Va., coals, only two Western coals being available.

Since that time the vast area of coal country, extending from Pittsburgh, Pa, to Birmingham, Ala., through the States of Pennsylvania, Maryland, West Virginia, Virginia, Kentucky, Tennessee, Georgia, and Alabama, the middle basin of Ohio, Indiana, and Illinois, and a considerable number of coals west of the Mississippi River have been developed and are actively worked, so that 106,906,295 gross tons of coal were mined in this country in 1884, as against less than 2,000,000 gross tons in 1840.

Aside from this large mass of new material requiring investigation the methods of experimental science have greatly advanced since 1844,

and results obtained now would have far more application and value than those of Professor Johnson.

The necessity and practical value of a new and complete examination of our American coals is evident from several recent articles upon the subject, deploring our lack of information, among which may be mentioned:

The Evaporative Power of Bituminous Coals, William Kent, Transaction Am. Soc. Mech. Eng., Vol. IV, p. 249.

Present State of the Subject, Heat of Combustion of Coal, B. F. Isherwood, Jour. Franklin Inst. 1884, Vol. CXVIII, p. 5.

Composition and Value of Pennsylvania Anthracite, C. A. Ashburner, Penn. 2d Geol. Survey, Report of Progress AA, p. XXX.

Report of Comparitive Merits of Anthracite and Bituminous Coal for Naval Use, Senate Ex. Doc. 26, 48th Congress, 2d Sess.

The Relative Value of Coals to the Consumer, H. M. Chance, Trans. A. I. M. E., Vol XIV, p. 19.

Classification and Composition Pennsylvania Anthracite, C. A. Ashburner, Trans A. I. M. E., Vol. XIV, p. 716.

Proposed Apparatus for Determining the Heating Power of Different Fuels, William Kent, Trans. A. I. M. E., Vol. XIV, p. 727.

The following extracts from letters to the curator also show the need of such an investigation.

Mr. Ashburner, the geologist in charge of the anthracite survey of Pennsylvania, says:

The subject of the chemical, physical, steaming, etc., properties of American coals is one of paramount scientific and practical importance. This question has never received the attention, as far as American coals go, that it demands. The work which has been done by English and European chemists and physicists in determining the true fuel value of coals has given us information in regard to the foreign coals of which we are at present totally ignorant in regard to our native fuels. The work which was done by Johnson was of great value for its day, but I regret to say that, in my opinion, similar work, which has been engaged in by American investigators since Johnson's time has added very little of a practical nature to his results. The fuel value which is put upon the coals (anthracite) by the trade is almost worthless; in fact it is worse than that, it is misleading.

Prof. Edward Orton, Geologist of the Ohio Survey, says:

I am greatly pleased to learn that you are about entering on the very important line of work indicated in your letter. I am constantly reminded of the incompleteness and inaccuracy of our best figures in this connection.

As a further indication of the practical value of the investigation it is only necessary to state that Mr. William Kent, an engineer of large experience in and about Pittsburgh, Pa., estimates that $675,000 are lost annually in Allegheny County, Pa., alone from the use of wasteful methods of raising steam. This loss occurs in the use of only a little over 1 per cent. of the coal production of the country.

From a scientific standpoint the results of such an investigation would have even more value than from an economic view. It is a source of constant complaint that so little is known upon the subject by writers and investigators.

Such an investigation would be a very large undertaking, such as no

individual or company or even State could undertake, and even if a State should undertake to investigate its own coals the results obtained, so far from filling the need, would only the more clearly demonstrate the necessity of including all the coals of the country in one investigation under one central authority.

In view of the foregoing facts the following plan for a new and complete investigation of American coals has been prepared:

(1) Each coal furnished for investigation to be submitted to a preliminary examination, both in the laboratory and practically, to determine its relationships and affinities.

(2) The coals to be divided into several classes according to the results of this examination, especially as regards the volatile matter contained.

(3) Each coal to be submitted to a series of tests on a practical scale to determine its fuel value.

(4) An examination to be made to determine the manner of combination of the chemical elements in the coals.

(1) In the preliminary examination it is designed to include nearly all the coals of the country, but the results of this examination will undoubtedly show so much similarity that in many cases a single coal can be selected for further examination which shall fairly represent several.

(2) It is essential to divide the coals into classes in order to prescribe the conditions of the practical tests, which should manifestly be different for a hard dry anthracite containing only 6 to 8 per cent. of volatile matter, from those of a soft bituminous coal with 30 per cent. or more, of volatile matter.

(3) The determination of the fuel value of the coals is the prime aim and object of the investigation.

To accomplish this end it is proposed to subject the coal to combustion on a practical scale, under a boiler, or rather boilers, provided with suitable applicances for controlling the conditions of the combustion, measuring the work accomplished by the pounds of water evaporated by one pound of coal.

In order that the results obtained shall be of any practical value it is absolutely necessary that they should be strictly comparable. Having the coal divided into classes it is necessary, in order to obtain comparable results, to test each of a given class under as nearly as possible the same conditions. If now the investigation is limited to a single set of conditions for each class of coals, as was done by Professor Johnson, then the practical application of the results will also be limited to the same or similar conditions, and should they be applied to different conditions would surely lead to false results. Hence it is proposed to adopt several sets of conditions for each class of coals. Again, a single experiment will not give a satisfactory or true result, and it becomes necessary to make several tests under each set of conditions. So that, finally, in order to obtain thoroughly satisfactory results, each coal should

be subjected to not less than thirty tests. As at least one day will be consumed by each test it is plainly evident that several boilers will be required for the investigation in order to bring it to completion within a reasonable time, and under the most favorable circumstances the practical testing of a single coal will probably occupy a week.

(4) In the present state of our knowledge we know absolutely nothing of the chemical constitution of coals, and the investigation in this direction will be on entirely new grounds. The work will be confined to the laboratory, and will require much patient labor.

The combustible portion of coal consists essentially of carbon, hydrogen, and oxygen, with small amounts of other elements, especially sulphur and nitrogen. In the ordinary methods of chemical examination of coal there are two methods followed. In one we determine the amounts of volatile matter containing nearly all the hydrogen and oxygen with some carbon, and the coke, consisting of carbon with only a very small amount of hydrogen and oxygen, left after heating. In the other we determine the percentages of each element. Now, while results obtained in this way have some value, yet they show us nothing of the condition of the elements in the coal itself, as whether or not any of the carbon exists in the free state in the coal, whether the volatile portion exists as such already formed in the coal, or whether it is produced from the decomposition of other combinations in the coal which are broken up by the heat.

By the determination of the heating power of the coals of the whole country, results will be obtained which will be of inestimable value to every large consumer of coal, as by them he can readily ascertain which coal at his command is really the cheapest, which may or may not be the one that costs the least money.

Testing under several sets of conditions, besides allowing a much wider field of application, will also show the error of using methods of combustion which are not suited to the coal used.

The results of the chemical examination will have wide application in certain industries, such as the manufacture of illuminating gas, and the production of coke for metallurgical purposes, while they would also throw much light upon the question of gas in mines, which would give them an added value from the question of human life involved.

A careful estimate of the number of coals that it would be desirable to test, places it between 200 and 250. Under the most favorable circumstances these would require between five and six years for thorough examination.

This estimate is based upon the use of six boilers of about 20 horse-power, properly erected with the necessary attachments for controlling and observing the combustion, put up in a suitable building that has railway communication.

There also will be required a laboratory for the chemical and physical work, provided with a large amount of special apparatus.

About 1,500 pounds of coal will be required for each test, so that at least 20 tons of each coal will be required for a thorough examination. The samples of coal should be furnished by the mining companies or other parties interested.

To properly inaugurate the investigation would require an appropriation of at least $20,000.

The total number of specimens in the department is about 48,000. Of these 17,000 have been placed in the exhibition series, 6,445 have been assigned to the reserve series, 1,503 to the duplicate series, and twenty-one boxes of duplicate material have been placed on general storage. Besides the specimens definitely assigned to the reserve series, there is yet a large mass of unorganized material that for the present and for some time to come must be classed in the reserve series.

As the material of this department becomes more thoroughly organized, both the richness and the deficiencies of the collections that formed the basis of its inauguration become more and more apparent.

The collections illustrating the mineral wealth of our own country are full and complete, as nearly every prominent mining locality is well represented, so that the collections show very completely where and to what extent valuable deposits have already been found or may be looked for; but of the nature of the ores and the methods of occurrence in various localities, and of the processes of mining and preparation of the material, the illustrations are very meager and incomplete.

The curator has made many attempts by correspondence to enlist the aid of friends engaged in mining, and while these efforts have frequently resulted in much valuable material being gathered, yet despite the utmost care in describing what is wanted, and an apparent willingness in the parties addressed to take a little trouble in the matter, it has been very difficult indeed to gather such systematic collections as are needed.

The department is already tolerably well supplied with large and showy specimens, and is abundantly supplied with the ordinary run of museum specimens; but what is needed are systematic collections, which need not necessarily be large, gathered with especial reference to showing the nature, the methods of occurrence of the various ores in different regions, to illustrating the methods of mining pursued, and to showing the method of preparing the ores for smelting. Now, most mining engineers have not the time to devote to making these collections as they should be made, for to do the work properly requires considerable time and exertion; so that in order to get just what we want it is absolutely essential to make it an object for some one to do the work.

The original collections illustrating the utilization of the mineral resources of the country, consisted for the most part of elaborate and highly wrought samples of the finished product, showing little or nothing of the methods of production; so that the collections taken together

show the beginning and end very profusely, but leave a tremendous void in the middle. The collections gathered for the New Orleans Exposition were mainly designed to fill this gap, and a great deal was accomplished, but much more remains to be done. The same difficulties as to volunteer collections are encountered here as in the case of the ores, but in a greater degree, although there are one or two exceptions to the general rule, and in a few cases very complete and valuable collections have been sent by practicing metallurgists.

The success of the department in employing special collectors for the New Orleans Exposition was such as to convince the curator that a very small outlay, to be expended in making a few collections each year, would yield an enormous return to the Museum. It is earnestly hoped that arrangements can soon be made whereby a small sum may be annually available for the purpose of increasing the collections made at that time. There are young men graduating every year from our technical schools, who, for the sake of visiting mines and works under the auspices of the Smithsonian Institution, would be only too willing to devote a portion or all of their summer vacations to this purpose, the Museum being called on to pay only the actual expenses. This was the plan followed in making the New Orleans Exposition collections, and much very valuable material was gathered.

The clerical work of the department has been ably performed during the whole year by Mr. W. H. Newhall.

PART III.

PAPERS DESCRIBING AND ILLUSTRATING THE COLLECTIONS IN THE U. S. NATIONAL MUSEUM.

I. The Meteorite Collection in the National Museum; a Catalogue of Meteorites represented November 1, 1886. By F. W. CLARKE.

II. The Gem Collection. By GEORGE F. KUNZ.

III. The Collection of Building and Ornamental Stones; a Hand-book and Catalogue. By GEORGE P. MERRILL.

IV. The Collection of Textiles; List of Fibers and Fabrics. By RUFUS W. DEERING.

V. Instructions for Preparing Microscopical Mounts of Vegetable Textile Fibers. By ROMYN HITCHCOCK.

VI. Instructions for Collecting Skins of Mammals, for Study or Mounting. By WILLIAM T. HORNADAY.

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VI. Instructions for Collecting Skins of Mammals, for Study or Mounting. By WILLIAM T. HORNADAY.

10. DALTON, Whitfield County, Ga. Found in 1879. The mass described by Shepard. 36.4 grammes. By exchange from Prof. C. U. Shepard.
11. LOSTTOWN, Cherokee County, Ga. Plcughed up in 1868. Fragment, 6.65 grammes. By exchange from Prof. C. U. Shepard.
12. PUTNAM COUNTY, Ga. Found in 1839. 328 grammes. Gift of J. Berrien Lindsley.
13. CHULAFINEE, Cleberne County, Ala. Ploughed up in 1873. Fragment, 8.6 grammes. By exchange from B. Stürtz.
14. AUBURN, Macon County, Ala. Ploughed up previous to 1869. 28.8 grammes. By exchange from Prof. C. U. Shepard.
15. COCKE COUNTY, Tenn. Described in 1840. Fragment, 7.24 grammes. By exchange from Ward and Howell.
16. BABB'S MILL, Green County, Tenn. Ploughed up earlier than 1842. Weight of specimen, 38.4 grammes. By exchange from the cabinet of Harvard University.
17. TAZEWELL, Claiborne County, Tenn. Ploughed up in 1853. 152 grammes. Gift of J. Berrien Lindsley.
18. CARTHAGE, Smith County, Tenn. Found about 1844. Weight of specimen, 65 grammes. By exchange from cabinet of Harvard University.
19. COOPERTOWN, Robertson County, Tenn. Found in 1860. Section, measuring 16 centimeters by 10 centimeters, and weighing 633 grammes. Gift of D. Crockett, through J. Berrien Lindsley.
20. MURFREESBORO, Rutherford County, Tenn. Found about 1847–'48. Weight of specimen, 57.5 grammes. By exchange from cabinet of Harvard University.
21. TENNESSEE. The "Lea iron" of the Philadelphia Academy of Natural Sciences. Slice weighing 221 grammes. By exchange from the Academy of Natural Sciences.
22. LAGRANGE, Oldham County, Ky. Found in 1860. 223 grammes. Gift of J. Berrien Lindsley.
23. ALLEN COUNTY, Ky. Found in 1867. Two specimens, 66.5 and 33.3 grammes, the larger one showing a troilite nodule; also a plaster model of the original mass. Received from Ward and Howell.
24. NELSON COUNTY, Ky. Ploughed up in 1860. A slice, weighing 370 grammes, and a rough surface fragment of 217 grammes. Gift of J. Berrien Lindsley.
25. MADISONVILLE, Ohio. Found in a prehistoric mound, No. 3 of the Turner Group. Fragment, weighing 14.8 grammes. Gift of Peabody Museum of American Archæology.
26. WALKER TOWNSHIP, Kent County, Mich., near Grand Rapids. Found about May 15, 1883. Nearly entire, weight 47,650 grammes; with a fac-simile cast to show the original state of the iron. Deposited by C. G. Pulcher.
27. TRENTON, Washington County, Wis. 327 grammes.
28. BUTLER, Bates County, Mo. Weight of specimen, 270 grammes. By exchange from the cabinet of Harvard University.
29. CABIN CREEK, Johnson County, Mo. Seen to fall, March 27, 1886. Fragment, weight 33.65 grammes. Gift of J. C. Betten. Also a facsimile model.
30. BEAR CREEK (Aeriotopos), Colo. Found in 1866. 27.73 grammes. By exchange from the cabinet of Amherst College.
31. WICHITA COUNTY, Tex. Described in 1884. Weight of fragment, 20.8 grammes. By exchange from Prof. C. U. Shepard.
32. RED RIVER, Tex. The Gibbs Meteorite. Fragment, 10.6 grammes. By exchange from the cabinet of Harvard University.
33. GLORIETA MOUNTAIN, Santa Fé County, N. Mex. Found in 1884. 380 grammes. By exchange from G. F. Kunz.
34. ALBUQUERQUE, N. Mex. Found about 1884. 2.61 grammes of turnings. Gift of L. G. Eakins.
35. SHINGLE SPRINGS, El Dorado County, Cal. Found in 1869–70. Weight of specimen, 32.4 grammes. By exchange from cabinet of Yale College.

PLATE I.

THE TUCSON, IRWIN, AINSA, OR SIGNET METEORITE.

36. TRINITY COUNTY, Cal. Found about 1875. 3.65 grammes of clippings. By exchange from Prof. C. U. Shepard.
37. IVANPAH, San Bernardino County, Cal. Described in 1880. 70 grammes of turnings. Gift of State Mining Bureau of California.
38. TUCSON, Ariz. The Signet, Irwin, or Ainsa meteorite. Originally from the Santa Catarina Mountains, but long used in Tucson for an anvil. Weight, about 620 kilogrammes, or 1,400 pounds. Height, 97 centimeters; greatest width, 124 centimeters; width of opening, 68 centimeters; greatest thickness of ring, 49 centimeters; least thickness of ring, 4.5 centimeters. Gift of Dr. B. J. D. Irwin, U. S. Army.
39. SANCHA ESTATE, Coahuila, Mexico. The Couch meteorite. Weight, 105,400 grammes. Gift of Lieut. Darius N. Couch, U. S. Army.
40. SANTA ROSA, Coahuila, Mexico. The iron described by Lupton in 1885. Fragment, weighing 19.3 grammes. Gift of Prof. N. T. Lupton.
41. ZACATECAS, Mexico. Fragment, 14.8 grammes. Gift of J. Berrien Lindsley.
42. TOLUCA, Mexico. One polished slice, 850 grammes. From Ward and Howell in exchange.

    One mass of Xiquipilco, 31,298 grammes. Gift of the National Museum of Mexico.
43. CHIHUAHUA, Mexico. An uncut mass, to be described. Weight about 1,800 kilogrammes.
44. SAN LOUIS POTOSI, Mexico. Fragment, weighing 57.4 grammes. Received among the Grant relics.
45. TOCAVITA, New Granada. Found in 1810. A fragment of less than 1 gramme. By exchange from S. C. H. Bailey.
46. SANTA CATARINA, Brazil. Found in 1875. Fragment, weighing 82.4 grammes. By exchange from the cabinet of Yale College.
47. GREENLAND. (Not Ovifak). Weight, 15.65 grammes. By exchange from S. C. H. Bailey.
48. ROWTON, Shropshire, England. Fell April 20, 1876. Weight of specimen, 19.5 grammes. By exchange from the British Museum.
49. OBERNKIRCHEN, Schaumburg-Lippe, Germany. Weight of specimen, 152.5 grammes. By exchange from the British Museum.
50. SEELÄSGEN, Brandenburg, Prussia. Weight of specimen, 104.5 grammes. By exchange from B. Stürtz.
51. BRAUNAU, Bohemia. Fell July 14, 1847. Fragment, 7.35 grammes. By exchange from S. C. H. Bailey.
52. ARVA, Hungary. Described in 1844. 98 grammes. By exchange from S. C. H. Bailey.
53. CAPE OF GOOD HOPE, Africa. Found in 1793. 28.95 grammes. By exchange from Prof. C. U. Shepard.
54. ORANGE RIVER, South Africa. Weight of specimen, 99.4 grammes. By exchange from the cabinet of Amherst College.
55. LION RIVER, Great Namaqualand, South Africa. Described in 1853. 34.87 grammes. By exchange from the cabinet of Amherst College.
56. CRANBOURNE, Victoria, Australia. 25.3 grammes of fragments, heated in hydrogen; and a nodule of troilite weighing 71.5 grammes. By exchange from the British Museum.
57. LOCALITY UNKNOWN. Partially described by Shepard in 1881. Found without record in the old Smithsonian collection. Specimen nearly entire, weighing 3,510 grammes.
58. THE ABERT IRON. Locality unknown. Found without label, entire, in a collection of minerals made by the late Col. J. J. Abert, and presented to the Museum by his son, J. T. Abert. Original weight, 456 grammes. There now remain in the collection—the main mass, 150 grammes; a polished section, 49 grammes.

STONY IRONS.

59. ESTHERVILLE, Emmet County, Iowa. Shower fell May 10, 1879.
Stony fragment, 145 grammes; fragment showing peckhamite, 82 grammes; two small fragments of olivine; seven masses of iron, aggregating 65 grammes. Gift of Charles P. Birge.
Thirty-one small irons, 96 grammes. By exchange from Prof. C. U. Shepard.
60. RITTERSGRÜN, Saxony. Found in 1833. 38 grammes. Gift of Adrian Van Sinderen.
61. BREITENBACH, Bohemia. Found in 1861. Weight of specimen, 53.7 grammes. By exchange from the British Museum.
62. KRASNOJARSK, Siberia. The "Pallas iron," found in 1749. Fragment, 6.8 grammes. By exchange from S. C. H. Bailey.
63. SIERRA DE CHACO, Vaca Muerta, Desert of Atacama, South America. 449 grammes. From University of St. Jago, Chili.
64. IMILAC, Desert of Atacama, South America. Specimen weighing 197 grammes, and several fragments. Collected by Lieut. F. M. Gilliss, U. S. Navy.

METEORIC STONES.

65. SEARSMONT, Me. Fell May 21, 1871. Two fragments, 16 grammes. Gift of A. C. Hamlin.
66. TOMHANNOCK CREEK, Rensselaer County, N. Y. Found in 1863–'64. Thin slice, not weighed. By exchange from S. C. H. Bailey.
67. DRAKE CREEK, Nashville, Tenn. Fell May 9, 1827. Fragment, 28 grammes. By exchange from cabinet of Harvard University.
68. CASTALIA, Nash County, N. C. Fell May 14, 1874. Fragment, 19.7 grammes. By exchange from cabinet of Harvard University.
69. HARRISON COUNTY, Ind. Fell March 28, 1859. Fragment, 10.4 grammes. Gift of J. Berrien Lindsley.
70. ROCHESTER, Fulton County, Ind. Fell December 21, 1876. Fragment, 2.0 grammes. By exchange from Prof. C. U. Shepard.
71. NEW CONCORD, Guernsey County, Ohio. Fell May 1, 1860.
One stone, 197 grammes. Gift of Prof. E. B. Andrews.
One large fragment, 1,720 grammes. Gift of J. Berrien Lindsley.
72. IOWA COUNTY, Iowa. Fell February 12, 1875.
One stone, 322 grammes. By exchange from Prof. C. U. Shepard.
One fragment, 79 grammes. Gift of Prof. J. R. Eastman.
73. CAPE GIRARDEAU, Mo. Fell August 14, 1846. Fragment, 4.35 grammes. By exchange from cabinet of Yale College.
74. LITTLE PINEY, Pulaski County, Mo. Fell February 13, 1839. Fragment, 2.0 grammes. By exchange from Prof. C. U. Shepard.
75. WARRENTON, Warren County, Mo. Fell January 3, 1877. Fragment, 10.8 grammes. By exchange from Prof. C. U. Shepard.
76. WACONDA, Mitchell County, Kans. Found in 1874. Fragment, 8.0 grammes. Gift of G. W. Chapman.
77. SALT LAKE CITY, Utah. Found in 1869. Fragment, 2.81 grammes. By exchange from cabinet of Yale College.
78. TAMATLAN, Jalisco, Mexico. Fell in August, 1879. Fragment, 4.14 grammes. By exchange from Prof. C. U. Shepard.
79. UTRECHT, Netherlands. Fell June 2, 1843. One fragment of 2.7 grammes, and 25.9 grammes of coarse powder. By exchange from B. Stürtz.
80. L'AIGLE, Orne, France. Fell April 26, 1803. Fragment, 56 grammes. By exchange from S. C. H. Bailey.
81. JUVINAS, Ardèche, France. Fell June 15, 1881. Fragment, 1.82 grammes. By exchange from Prof. C. U. Shepard.

82. ALFIANELLO, near Brescia, Italy. Fell February 16, 1883. Fragment, 61.3 grammes. By exchange from Ward and Howell.
83. SKI, Amt Akershuus, Norway. Fell December 27, 1848. Fragment, 0.25 grammes. By exchange from Prof. C. U. Shepard.
84. HESSLE, near Upsala, Sweden. Fell January 1, 1869. Stone nearly perfect, 11.2 grammes. By exchange from S. C. H. Bailey.
85. PULTUSK, Poland. Fell January 30, 1868. Entire stone, 158 grammes. By exchange from Ward and Howell.
86. KNYAHINYA, Hungary. Fell June 9, 1866. Fragment, 27.8 grammes. By exchange from cabinet of Harvard University.
87. MOCS, Kolos, Transylvania. Fell February 3, 1882. Entire stone, 95 grammes. By exchange from Ward and Howell.
88. STANNERN, Moravia. Fell May 22, 1808. Fragments, 14.0 grammes. By exchange from B. Stürtz.
89. SIKKENSAARE, Tennassilm, Russia. Fell June 28, 1872. Fragment, 48.2 grammes. By exchange from B. Stürtz.
90. SOKO-BANJA, Alexinatz, Servia. Fell October 13, 1877. Fragment, 1.75 grammes. By exchange from Prof. C. U. Shepard.
91. KRAKHUT, Benares, India. Fell December 19, 1798. Fragment, 0.55 gramme. By exchange from Prof. C. U. Shepard.
92. DHURMSALA, Punjab, India. Fell July 14, 1860. Fragment, 47.5 grammes. By exchange from B. Stürtz.
93. CHANDAKAPUR, Berar, India. Fell June 6, 1838. Fragment, 3.9 grammes. By exchange from S. C. H. Bailey.
94. SITATHALI, Central Provinces, India. Fell March 4, 1875. Fragment, 13.5 grammes. By exchange from the British Museum.
95. PARNALLEE, Madras, India. Fell February 28, 1857. Fragment, 87 grammes. Gift of Prof. C. A. Young.
96. MOTEEKA-NUGLA, Bhurtpur, India. Fell December 22, 1868. Fragment, 2.8 grammes. By exchange from the British Museum.
97. JHUNG, Punjab, India. Fell in June, 1873. Small fragments, 1.22 grammes in all. By exchange from Ward and Howell.
98. BUTSURA, Bengal, India. Fell May 12, 1861. Fragment, 11 grammes. By exchange with the British Museum.
99. BANDONG, Java. Fell December 10, 1871. Fragment, 1.6 grammes. By exchange from Prof. C. U. Shepard.
100. COLD BOKKEVELDT, Cape Colony, Africa. Fell October 13, 1838. Fragment, 4.0 grammes. Gift of United States Consul J. Vorsfeld.

DOUBTFUL METEORITES.

101. JEFFERSON COUNTY, Tenn. Found near New Market Station. Weight, 571 grammes. Obtained at the locality in 1885 by Mr. Ira Sayles, U. S. Geological Survey. An iron of peculiar character, not certainly meteoric.

ADDENDA.

Bringing the catalogue down to October 20, 1888.

101. WESTON, CONN. Fell December 14, 1807. Fragment, 17 grammes. By exchange with J. R. Gregory.
102. GREENBRIER COUNTY, W. VA. Iron. Fragment, 11 grammes. By exchange with the British Museum.
103. CHATTOOGA COUNTY, GA. Iron. Fragment, 19.5 grammes. Gift of G. F. Kunz.
104. WALKER COUNTY, ALA. Iron. Found in 1832. Fragment, 14 grammes. By exchange with Ward and Howell.

105. CRAB ORCHARD MOUNTAINS, near Rockwood, Tenn. Found in March, 1887. Two slabs, 39.8 and 34 grammes. Gift of Ward and Howell.
106. LINN COUNTY, IOWA. Fell February 25, 1847. Fragment, 23.7 grammes. By exchange with G. F. Kunz.
107. TANEY COUNTY, MO. Stony iron. Fragment, 34 grammes. Gift of G. F. Kunz.
108. MISSOURI. Undescribed iron. Slab, 245 grammes. By exchange with G. F. Kunz. Obtained by Kunz from Professor Potter, of Saint Louis.
109. FAYETTE COUNTY, TEX. Stony iron, found abont 1878. Two fragments, 110 and 137 grammes. Gift of Ward and Howell.
34. ALBUQUERQUE, N. MEX. Iron. Slab, 56 grammes. Gift of Richard Pearce. (Glorieta?)
110. SAN EMIGDIO MOUNTAINS, San Bernardino County, Cal. 119 grammes in small fragments. Given by Thomas Price to G. P. Merrill, of the U. S. National Museum.
111. INDEPENDENCE COUNTY, ARK. Iron. Slab, 309 grammes. By exchange with the K. K. Hofmineralien-Cabinet, Vienna.
112. ANGRA DOS REIS, BRAZIL. Fell January, 1879. Fragment, 8.6 grammes. By exchange with the National Museum at Rio de Janeiro.
113. ITAPICURU MIRIM, BRAZIL. Fell March, 1879. Fragment, 9.7 grammes. By exchange with the National Museum at Rio de Janeiro.
114. MACAYO, RIO GRANDE DO NORTE, BRAZIL. Fell November 11, 1836. Fragment, 68.5 grammes. By exchange with the National Museum at Rio de Janeiro.
115. PROVINCE OF MINAS GERAES, BRAZIL. Fragment, 10.9 grammes. By exchange with the National Museum at Rio de Janeiro.
116. CHARSONVILLE, FRANCE. Fell November 23, 1810. 54 grammes. By exchange with Baron Braun.
117. ENSISHEIM, ELSASS, GERMANY. Fell November 16, 1492. Fragment, 3.5 grammes. By exchange with J. R. Gregory.
118. STEINBACH, ERZGEBIRGE. Fragment, 2 grammes. By exchange with the K. K. Hofmineralien-Cabinet at Vienna.
119. BITBURG, PRUSSIA. Fragment, 22 grammes. By exchange with J. R. Gregory.
120. HAINHOLZ, WESTPHALIA. Fragment, 7.5 grammes. By exchange with Baron Braun.
88. STANNERN, MORAVIA. Fell May 22, 1808. Nearly complete stone, 33 grammes. By exchange with the K. K. Hofmineralien-Cabinet at Vienna.
121. PAWLOWGRAD, EKATERINOSLAV, RUSSIA. Fell May 19, 1826. Fragment, 18 grammes. By exchange with J. R. Gregory.
122. BRAHIN, MINSK, RUSSIA. Fragment, 14 grammes. By exchange with J. R. Gregory.
123. TABORSKOJE SELO, RUSSIA. Fell August 30, 1887. 161 grammes. By exchange with J. v. Siemaschko.
124. MIKENSKOI, GROSNJA, CAUCASUS, RUSSIA. Fell June 28, 1861. Fragment, 4.5 grammes. By exchange with Baron Braun.
125. DJATI PENGILON, JAVA. Fell March 19, 1884. 469 grammes. Gift of the Government of the Netherlands East Indies.
126. YARRA YARRA RIVER, AUSTRALIA (Cranbourne?). Fragment, 15.9 grammes. By exchange with J. R. Gregory.
127. FUKUTOMI, KINEJIMA, HIZEN, JAPAN. Fell March 19, 1882. Fragment, 9.7 grammes. Gift of Educational Museum at Tokio.
128. MAÊMÊ, HISLUGARI, SATSUMA, JAPAN. Fell November 10, 1886. Gift of Educational Museum at Tokio.

SUPPLEMENT.

THE SHEPARD COLLECTION OF METEORTES.

Deposited in the National Museum by Prof. Charles Upham Shepard, jr.

I.—Meteoric Irons.

No.	Date of find.	Where found.	Weight.
			Grammes.
1	1400	Elbogen, Bohemia	4.45
2	1600	La Caille, Var, France	1.48
3	1749	Krasnojarsk, Jeniseisk, Siberia. (The Pallas meteorite)	327.
4	1784	Xiquipilco, Toluca, Mexico	688.
5	1788	Tucuman, Otumpa, Argentine Republic	23.8
6	1792	Zacatecas, Mexico	175.3
7	1793	Cape of Good Hope, Africa	182.5
8	1797	Prambanan, Java	2.3
9	1804	Misteca, Oaxaca, Mexico	18.5
10	1804	Durango, Mexico	45.43
11	1807	Bitburg, Prussia	19.
12	1810	Brahin, Minsk, Russia	5.13
13	1810	Rasgatà, Tocavita, New Granada	15.
14	1814	Lenarto, Scharosch, Hungary	17.52
15	1814	Red River, Texas	63.7
16	1819	Burlington, Otsego County, N. Y	1,528.3
17	1829	Bohumilitz, Prachin, Bohemia	0.95
18	1834	Scriba, Oswego County, N. Y	61.83
19	.....	Fell July 31 or August 1, 1835, at Charlotte, Dickson County, N. C	2.70
20	1836	River Brazos, Wichita County, Tex	212.40
21	1837	Bonanza, Chihuahua, Mexico	238.6
22	1839	Putnam County, Ga	68.55
23	1839	Asheville, Buncombe County, N. C	2.95
24	1840	Cosby's Creek, Cocke County, Tenn	69.16
25	1842	Babb's Mill, Greene County, Tenn	20.63
26	1844	Arva, Szlanicza, Hungary	123.50
27	1844	Carthage, Smith County, Tenn	48.1
28	1845	Lockport, Niagara County, N. Y	33.2
29	1846	Tula, Netschaëvo, Russia	61.95
30	1846	Tucson, Ariz. (The Carleton iron)	36.84
31	1847	Murfreesboro, Rutherford County, Tenn	5.88
32	1847	Chester, S. C	115.45
33	1847	Rittersgrün, Saxony	65.45
34	1847	Seeläsgen, Brandenburg, Prussia	111.6
35	.....	Fell July 14, 1847, Braunau, Hauptmannsdorf, Bohemia	14.5
36	1850	Ruff's Mountain, Lexington County, S. C	5,461
37	1850	Salt River, Kentucky	51.56
38	1850	Schwetz, Prussia	10.55
39	1851	Seneca Falls, Cayuga County, N. Y	80.2
40	1853	Lion River, Namaqualand, South Africa	20.85
41	1853	Tazewell, Claiborne County, Tenn	1,943.5
42	1853	Union County, Ga	124.5
43	1854	Jewell Hill, Madison County, N. C	31.85
44	1854	Oktibbeha County, Miss	1.89
45	1854	Emmetsburg, Md	5.5
46	1854	Madoc, Ontario, Canada	19.65
47	1854	Werchne Udinsk, Russia	36.30
48	1854	Cranbourne, Australia	10.6
49	1854	Sarepta, Saratov, Russia	3.3
50	1855	Sancha Estate, Coahuila, Mexico	183.7
51	1856	Marshall County, Ky	68.23
52	1856	Denton County, Tex	7.97

THE SHEPARD COLLECTION OF METEORITES—Continued.

I.—Meteoric Irons—Continued.

No.	Date of find.	Where found.	Weights.
			Grammes.
53	1856	Orange River, South Africa	21.41
54	1856	Hainholz, Minden, Westphalia	12.15
55	1856	Imilac, Atacama, Bolivia	36.65
56	1858	Wayne County, Ohio	2.86
57	1858	Trenton, Washington County, Wis	91.46
58	1860	Coopertown, Robertson County, Tenn	327.83
59	1860	Nelson County, Ky	58.3
60	1860	Lagrange, Oldham County, Ky	2,002.
61	1861	Breitenbach, Saxony	16.8
62	1862	Vaca Muerta, Sierra de Chaco, Atacama, Bolivia	27.63
63	.....	Fell in 1862, Victoria West, Cape Colony	2.15
64	1863	Southeast Missouri	5.6
65	1866	Chili	4.76
66	1866	Bear Creek, Aeriotopos, Colo	307.08
67	1867	Auburn, Macon County, Ala	228.15
68	1867	Losttown, Cherokee County, Ga	75.4
69	1867/1868	Mejillones, Atacama, South America	29.8
70	1869	Near Staunton, Augusta County, Va	1,662.
71	1872	Nenntmannsdorf, Saxony	15.15
72	1873	Chulafinnee, Cleburne County, Ala	54.
73	1873	Eisenberg, Altenburg, Saxony	9.7
74	1874	Butler, Bates County, Mo	391.
75	1875	Santa Catarina, Morro do Rocio, Brazil	253.9
76	1877	Casey County, Ky	3.30
77	1879	Dalton, Whitfield County, Ga	50,917.
78	1879	Lick Creek, Davidson County, N. C	9.72
79	.....	Fell May 10, 1879, Estherville, Emmet County, Iowa	3,575.
80	1879	Campo del Pucara, Catamarca, New Granada	0.92
81	1879	Ivanpah, San Bernardino County, Cal	11.75
82	1880	Lexington, S. C	3,992.
83	1881	"The Smithsonian iron"	88.3
84	1883	Grand Rapids, Mich	34.5
85	1884	Glorieta Mountain, Santa Fé County, N. Mex	853.4
86	.....	East Tennessee. (The iron of the Philadelphia Academy of Natural Sciences)	260.0
87	1886	Bacubirito, Sinaloa, Mexico	171.4
88	.....	Sevier County, Tenn ..... Turnings	.....
89	.....	Trinity County, Cal	22.55
90	.....	Chemnitz, Hungary	75.27
91	.....	From burned museum at Baltimore	2.73
92	.....	"The Abert iron"	11.3

II.—Terrestrial Irons. (Formerly supposed to be meteoric.)

1	1848/1850	Niakornak, Greenland	5.7
2	1870	Ovifak, Greenland	18.97

THE SHEPARD COLLECTION OF METEORITES—Continued.

III.—Meteoric Stones.

No.	Date of fall.	Place of fall.	Weight.
			Grammes.
1	Nov. 16, 1492	Ensisheim, Elsäss, Germany	4.3
2	July 3, 1753	Tabor, Bohemia	2.45
3	July, 1766	Albareto, Modena, Italy	1.00
4	July 24, 1790	Barbotan, Landes, France	28.7
5	June 16, 1794	Siena, Italy	6.75
6	Dec. 13, 1795	Wold Cottage, Thwing, Yorkshire, England	13.02
7	Mar. 12, 1798	Salles, Villefranche, France	2.0
8	Dec. 19, 1798	Krakhut, Benares, India	7.32
9	Apr. 26, 1803	L'Aigle, Orne, France	11.35
10	Mar. 15, 1806	Alais, Garde, France	0.60
11	Dec. 14, 1807	Weston, Conn	74.37
12	May 22, 1808	Stannern, Moravia	25.70
13	Aug. 1810	Mooresfort, Tipperary, Ireland	1.00
14	Nov. 23, 1810	Charsonville, near Orleans, France	3.77
15	Mar. 12, 1811	Kuleschowka, Poltava, Russia	5.95
16	April 15, 1812	Erxleben, Prussia	30.60
17	Aug. 5, 1812	Chantonnay, Vendée, France	5.1
18	Feb. 15, 1814	Bachmut, Ekaterinoslav, Russia	8.6
19	June 13, 1819	Jonzac, Charente-Inférieure, France	0.17
20	July 12, 1820	Lixna, Witebsk, Russia	1.19
21	June 15, 1821	Juvinas, Ardèche, France	39.5
22	June 3, 1822	Angers, Maine-et-Loire, France	0.72
23	Nov. 30, 1822	Allahabad, Futtehpur, India	2.22
24	Jan. 15, 1824	Renazzo, Ferrara, Italy	7.20
25	1825	Mung, Loiret, France	3.27
26	Feb. 10, 1825	Nanjemoy, Md	31.22
27	Sept. 14, 1825	Honolulu, Hawaiian Islands	1.35
28	May 19, 1826	Pawlograd, Ekaterinoslav, Russia	3.11
29	May 9, 1827	Drake Creek, Nashville, Sumner County, Tenn	4.18
30	June 4, 1828	Richmond, Va	3.69
31	May 8, 1829	Forsyth, Ga	9.50
32	Aug. 14, 1829	Deal, N. J	4.19
33	July 18, 1831	Vouillé, near Poitiers, France	14.57
34	June 6, 1838	Chandakapur, Berar, India	1.05
35	Oct. 13, 1838	Cold Bokkeveldt, Cape Colony	9.72
36	Feb. 13, 1839	Little Piney, Pulaski County, Mo	75.44
37	June 12, 1841	Château Renard, Loiret, France	3.74
38	Apr. 26, 1842	Milena, Warasdin, Croatia	46.25
39	June 4, 1842	Aumières, Lozère, France	(*)
40	Mar. 25, 1843	Bishopville, S. C	1,090.4
41	June 2, 1843	Utrecht, Holland	8.8
42	Found in 1846	Assam, India	6.75
43	May 8, 1846	Montemilone, Macerata, Italy	0.73
44	Feb. 25, 1847	Hartford, Linn County, Iowa	1,602.35
45	May 20, 1848	Castine, Me	(*)
46	Dec. 27, 1848	Ski, Amt Akershuus, Norway	1.00
47	Oct. 31, 1849	Cabarrus County, N. C	343.6
48	Jan. 23, 1852	Nellore, Madras, India	2.81
49	Aug. 5, 1855	Petersburg, Lincoln County, Tenn	30.7
50	Feb. 28, 1857	Parnallee, Madras, India	331.48
51	Apr. 15, 1857	Kaba, Hungary	0.20
52	Oct. 1, 1857	Les Ormes, Yonne, France	0.70
53	Dec. 27, 1857	Pegu (Quenggouk), British Burmah	19.65
54	Dec. 9, 1858	Ausson, Haute Garonne, France	20.1
55	Dec. 24, 1858	Molina, Murcia, Spain	3.67
56	Mar. 28, 1859	Harrison County, Ind	5.64
57	May 1, 1860	New Concord, Guernsey County, Ohio	3,311.87
58	July 14, 1860	Dhurmsala, Punjab, India	259.2
59	May 12, 1861	Butsura, India	7.83

* Fragment.

THE SHEPARD COLLECTION OF METEORITES—Continued.

III.—METEORIC STONES—Continued.

No.	Date of fall.	Place of fall.	Weight.
			Grammes.
60	Aug. 8, 1863	Pillistifer, Livland, Russia	2.6
61	Dec. 7, 1863	Tourinnes-la-Grosse, Tirlemont, Belgium	9.04
62	Found 1863–'4	Tomhannock Creek, Rensselaer County, N. Y	8.74
63	May 13, 1864	Orgueil, Tarn-et-Garonne, France	9.62
64	Jan. 19, 1865	Supuhee, Sidowra, Gorruckpur, India	4.3
65	Mar. 26, 1865	Claywater, Vernon County, Wis	9.35
66	May 30, 1866	St. Mesmin, Aube, France	1.59
67	June 9, 1866	Knyahinya, Hungary	32.83
68	Jan. 30, 1868	Pultusk, Poland	304.76
69	Feb. 29, 1868	Motto-di-Conti, Casale, Italy	1.53
70	Mar. 20, 1868	Daniel's Kull, Griqualand, South Africa	4.6
71	Dec. 5, 1868	Frankfort, Franklin County, Ala	4.7
72	Jan. 1, 1869	Hessle, near Upsala, Sweden	259.8
73	May 22, 1869	Clèguerec, Morbihan, France	52.65
74	Sept. 19, 1869	Tjabé-Padang, Java	29.1
75	Aug. 18, 1870	Cabeza de Muyo, Murcia, Spain	13.7
76	May 21, 1871	Searsmont, Waldo County, Me	62.5
77	Dec. 10, 1871	Bandong, Java	50.87
78	Found 1872	Waconda, Mitchell County, Kans	906.55
79	Aug. 31, 1872	Orvinio, Rome, Italy	0.12
80	Sept. 23, 1873	Khairpur, India	26.75
81	May 14, 1874	Near Castalia, Nash County, N. C	0.76
82	Nov. 26, 1874	Kerilis, Côtes-du-Nord, France	2.70
83	Feb. 12, 1875	West Liberty, Iowa County, Iowa	3,185.9
84	June 28, 1876	Ställdalen, Nya Kopparberg, Sweden	151.7
85	Dec. 21, 1876	Rochester, Fulton County, Ind	48.27
86	Jan. 3, 1877	Warrenton, Warren County, Mo	27.25
87	Jan. 23, 1877	Cynthiana, Harrison County, Ky	1.77
88	Oct. 13, 1877	Soko-Banja, Servia	15.98
89	July 15, 1878	Tieschitz, Moravia	27.00
90	Nov. 20, 1878	Rakovka, Tula, Russia	23.50
91	Jan. 31, 1879	La Bécasse, Indre, France	5.00
92	Aug. 17, 1879	Tamatlan, Jalisco, Mexico	511.00
93	Feb. 3, 1882	Mocs (Visa), Kolos, Hungary	17.85
94	Aug. 2, 1882	Pavlovka, Saratov, Russia	5.61
95	Feb. 16, 1883	Alfianello, Brescia, Italy	29.54

IV.—PSEUDO METEORITES.

1. Ivan-Oedenburg, Hungary	0.94

RECAPITULATION, SHEPARD COLLECTION.

Irons, meteoric	92
Irons, terrestrial	2
Stones	95
Pseudo meteorites	1
	190

ADDENDA, SHEPARD COLLECTION.

Bringing the catalogue down to October 20, 1888.

IRON CREEK, NORTH SASKATCHEWAN, BRITISH NORTH AMERICA. Iron, 125 grammes.

SMITHLAND, KY. IRON, 12.9 grammes.

ALLEN COUNTY, KY. Iron. 713 grammes.

INDEPENDENCE COUNTY, ARK. Iron, 20 grammes.

MAVERICK COUNTY, TEX. Iron, 116 grammes.
TUCSON, ARIZONA. The signet iron. 84.5 grammes.
TOLUCA, MEXICO. Iron. 17,800 grammes.
TARAPACÁ DESERT (HEMALGA), PERU. Iron, 84 grammes.
SANTA CATARINA, BRAZIL (altered). Iron. 7,200 grammes.
NEWSTEAD, SCOTLAND. Iron, 51 grammes.
POHLITZ, REUSS, GERMANY. Stone. Fell October 13, 1819. 0.16 gramme.
EICHSTADT, BAVARIA. Stone. Fell February 19, 1785. 1 gramme.
OBERNKIRCHEN, GERMANY. Iron. 23.1 grammes.
AGRAM, CROATIA. Iron. Fell May 26, 1751. 0.74 gramme.
MAUERKIRCHEN, AUSTRIA. Stone. Fell November 20, 1788. 0.5 gramme.
MEZO MADARASZ, TRANSYLVANIA. Stone. Fell September 4, 1852. 86.8 grammes.
ISLAND OF OESEL, BALTIC SEA. Stone. Fell May 11, 1855. 4 grammes.
TENNASSILM, ESTHLAND, RUSSIA. Stone. Fell June 28, 1872. 1 gramme.
TIMOCHIN, RUSSIA. Stone. Fell March 25, 1807. 15 grammes.
GROSS LIEBENTHAL, NEAR ODESSA, RUSSIA. Stone. Fell November 19, 1881. 8 grammes.
ASSISI, ITALY. Stone. Fell May 24, 1886. 29 grammes.
LUCIGNANO, SIENA, ITALY. Stone. 3.7 grammes.
TRENZANO, BRESCIA, ITALY. Stone. Fell November 12, 1856. 3.8 grammes.
GIRGENTI, SICILY. Stone. Fell February 10, 1853. 1.5 grammes.
NEJED, ARABIA. Iron. Fell 1865. 37 grammes.
SHYTAL, INDIA. Stone. Fell August 11, 1863. 1.32 grammes.
CRONSTADT, ORANGE RIVER FREE STATE, AFRICA. Stone. Fell November 19, 1877. 12.5 grammes.
YARRA YARRA RIVER, AUSTRALIA. Iron. 21 grammes. (Cranbourne?)

GEM COLLECTION OF THE U. S. NATIONAL MUSEUM.

By GEORGE F. KUNZ.

The collection of gems exhibited by the National Museum at the Cincinnati and New Orleans Expositions is now on exhibition in the Museum in Washington. This much-needed accession, representing a small part of the appropriation for the World's Fair, promises to be one of the most attractive and instructive features of the Museum. The large number of visitors, who examined the collection, both at the expositions and in its present location, can testify to its interesting character. Although a mere beginning, it is the most complete public collection of gems, in the United States. It is contained in three flat plate-glass exhibition cases, the gems being neatly marked with printed labels, and arranged on velvet pads, with a silk rope border. The diversity, brilliance, and richness of nature's brightest colors displayed render the whole effect a very attractive and pleasing one. The collection begins with a suite of glass models of the historical diamonds, followed by a series of diamonds in their natural state, among which is an interesting octahedron, 18 carats in weight*, and by two smaller, though very perfect, octahedra of about 2 carats each. These specimens are good illustrations of the form from South Africa, though of little commercial value as gems. One dozen other crystals, from one quarter to 1 carat in weight, complete a representative set of form and occurrence in that region. Next we have a very neat set of a dozen more crystals, small, but choice, principally from India and Brazil, formerly belonging to the Mallet collection. One of these is a perfect cube, a form peculiar to Brazil, while another is twinned parallel to the octahedron. Another stone of 1 carat is only half cut, and for comparison we have a stone of about the same weight completely cut.

* Gems are generally bought and sold by the weight, called a carat, which is equal to about 3.168 troy grains. It is usually divided, however, into 4 diamond or pearl grains, each of which is .7925 of a true grain. Fractions of a carat are also known as fourth, eighths, sixteenths, thirty-seconds, and sixty-fourths. The weight of the carat formerly differed slightly in different countries, and this diversity finally led a syndicate of Parisian jewelers, goldsmiths, and gem dealers, in 1871, to propose a standard carat. This was subsequently confirmed by an arrangement between the diamond merchants of London, Paris, and Amsterdam, fixing the uniform value of the diamond (?) carat at . 205 gramm.

Among the sapphires, we find a carat oblong stone of dark blue color, from the Jenks mine, Macon County, North Carolina, which has yielded a few fair sapphires—yellow, violet, and blue—and a few rubies, some of the finest of which were in the Leidy collection; also the first stones found here, the dark brown, asteriated sapphires, described in "Transactions of the New York Academy of Sciences," March, 1883, and two other cut stones weighing from 4 to 8 carats. These all show a slight bronze play of light on the dome of the cabochon in ordinary light, but, under artificial light, they all show well-defined stars, being really asterias or star sapphires, and not cat's eyes, as would seem at first glance. There are also two cut stones, light blue and light green, weighing 1 and 2 carats respectively, which, for light-colored sapphires, are perhaps, when cut, brighter than those from any other locality. The cutting of one of these gems has given it a remarkable luster. They are found in the sluice-boxes at and near Helena, Mont. Following are two broken crystals of the dark-green sapphires from the quite recent find at the Hills of Precious Stones in Siam, beautifully dichroic, being green and blue when viewed in different axes. The most showy group among the sapphires is a lot of thirteen assorted fancy stones, ranging from one-half to 4 carats in size. It includes two oriental amethysts, one oriental topaz, two pale rubies, four blue, one light-blue opalescent, one pale green, and two white sapphires. An asteria of good blue color, measuring nearly 1 inch across, a beautiful 2-carat ruby-asteria, and a small three-quarter-carat ruby, of fair color, complete the corundum gems.

The series of spinels is well chosen and varicolored; it consists of a long 2-carat stone of green color, an oblong almandine-colored stone of 3 carats, an inky stone of 1½ carats, a half-carat ruby spinel of fair color, a pretty rubicelle of three-quarters of a carat, and a suite of crystals of the ruby-colored spinel from Ceylon and Burmah. We have also a cut Alexandrite (so called after the Czar Alexander I), from the original Russian locality. This is of fair color; but the wonderful Ceylonese gems of recent years have really given to this phenomenal variety of chrysoberyl, which changes from green to red under artificial light, its present high rank among gems. There is a 6-carat typical chrysoberyl (the chrysolite of the jeweler), finely cut, truly, as the name indicates, golden beryl; and a dark green one of that shade, repeatedly sold as Alexandrite, though it does not change color by artificial light; also a rich yellowish-brown specimen of 1¼ carats. A set of seven rough fragments from Brazil is instructive by comparison.

Among the beryls, we have a flawed emerald of 10 carats, that well illustrates the typical color, as does a pear-shaped drop of about the same weight and quality. Besides these, there is a flawed stone of about the same weight, but much lighter in color, from Bogota. There is also a crystal, that has been in the Institution for many years, labeled from New Mexico. An emerald crystal, 1⅛ inches long, one of a series of minerals brought by Prof. J. D. Dana from Peru when with the

Wilkes Exploring Expedition, is historically interesting. It was purchased by him in the streets of Callao. In the same series are two good cut beryls, one 6 carats in weight, of a light-green color, another 1-carat light blue, both from Royalston Mass.; and perhaps the finest specimen ever found at the Portland (Connecticut) quarries, 15 carats in weight, and of such a rich, deep sea-blue color, as almost to rival in splendor the matchless 5-carat Brazilian blue stone, that is in the same case.

A fine blue beryl from the Mourne Mountains, Ireland, is interesting for its locality and deep color. Stoneham, Me., has contributed a 2-carat white cut stone and a similar fragment; while Siberia is represented by a common white stone of about 6 carats weight, and a rich yellow one of 2 carats.

Next comes a series of the emerald-green and greenish-yellow varieties of spodumene (Hiddenite), embracing crystals and fragments, and five cut stones, the latter weighing from a quarter to three-quarters of a carat, and varying in color from green to greenish-yellow, from Stony Point, N. C.; also a quarter-carat light yellow, and a 1-carat golden-yellow spodumene of the variety resembling chrysoberyl, described by Pisani, of Paris, in "Comptes Rendus" for 1877, from Brazil. The mountain-green cut euclase of 2 carats weight, from Brazil, and the white cut phenakite of 3 carats, from Russia, are of rare occurrence, though the latter has recently been found in two localities in Colorado.

The tourmalines include a dark-red gem (rubellite) of 6 carats' weight, and of good color; a dark-green one of the same weight; two light-red ones of one-half carat each, and a fine dark-blue one (indicolite) of three-eighths carat; a light sea-green one, of the same weight as the indicolite, and four long bottle-green (called Brazilian emeralds) of 2 carats each; two olive-green stones of 2 carats each, and four sections of green crystals, that have red centers. This difference of color between the outer and inner crystals is peculiar to tourmalines, as many as three colors being found in one crystal. All these are from Brazil. The well-known domestic localities are represented by an oblong, table-cut, light-green stone from Paris, Oxford County, Me., that once held a conspicuous place in the collection of Dr. Joseph Leidy, which, unfortunately, had to be scattered. From Auburn, Me., a locality quite recently discovered, we have a 1-carat blue indicolite, two lavender-colored stones of $1\frac{1}{2}$ and 2 carats each, a light emerald-green stone of three-quarters of a carat, as handsome as an emerald by artificial light, and a 2-carat green one of the same tint as the Leidy stone; also a suite of loose crystals of various colors. The neighboring 2-carat yellow and 3-carat yellowish-brown cut stones are from Ceylon. The fine 2-inch grass-green crystal and 1-inch bluish-green crystal are also part of the treasure brought home by Professor Dana from the Wilkes expedition of 1838–1842.

A 6-carat blue and a 2-carat sherry-colored topaz from Siberia are exceedingly brilliant; but the domestic reputation is well sustained by the

white 15 carat cut stone from Pike's Peak, Colo., which is not surpassed in beauty by the brilliant white 4-carat (Minas Novas) from Minas-Geraes, in Brazil. A 6-carat orange-yellow stone, also from Minas-Geraes, is quite characteristic of the topaz, which is most commonly used in jewelry. A series of two cut stones, of 5 and 8 carats respectively, and a number of crystal fragments show the effect, which heat has upon some varieties of topaz. These specimens vary in color from dark pink to white, according to the degree of calorification.

Among the garnets are ten flat, brilliant-cut stones, one carbuncle, two long table-cut stones, and six rose-cut from Bohemia; six Tyrolese red garnets, three essonites (usually sold as hyacinths by the jewelers), 4 carats, 1¼ and one-quarter carat from Ceylon, six small brilliant-cut stones from Cape Colony, and a series, cut and uncut, from New Mexico, which furnishes the finest garnets in the world in point of color. In addition to these, we notice a 1-carat and a 1½-carat demantoid (green garnet or Uralian emerald) from Bobrowska River, Syssersk, in the Urals, and a brownish-green 2-carat stone from the same locality.

From New Mexico we have a fine yellowish-green peridot or olivine, of 2½ carats, called chrysolite by the mineralogist, but not by the jeweler; also a number of pebbles of the same, known as "Job's Tears" locally (from their pitted, tear-like appearance). The Orient is represented by a beautiful olive-green cut stone of about 18 carats weight.

From the zircons or jargons we may single out for remark a number of small cut stones, steel-blue, yellowish-brown, yellow, and white, the latter color being often produced by heating. Stones of this kind were at one time used for incrusting watches, which were then sold as diamond-incrusted. Next we observe a fine, rich, hyacinth-colored gem (the true hyacinth of the mineralogist), a 2-carat green, a yellow, an orange, and a long brownish-green 3-carat stone, all from Ceylon. The 2-carat axinite, from Dauphiny, is one of the rarest of gems. A 6-carat greenish-brown epidote, from the Knappenwand, the well-known locality in Tyrol, should be mentioned.

Here, too, is a one-fourth-carat idocrase from Ala, in Piedmont. This mineral, which received the name of vesuvianite, because it is found among the formations in the lava at Vesuvius, is sold by the Neapolitan jewelers, and used to make the letters I and V in the manufacture of initial or sentimental pieces of jewelry. The same mineral is found at Sanford, Me., and other localities here, but rarely in gem form.

Iolite (dichroite, cordierite), or water sapphire (*saphire-d'eau*), as it is also called, is here seen in the form of a flat-cut stone of 2-carats' weight from Ceylon, and a cube one-fourth inch square from Bodenmais, Bavaria. These are not comparable with one found at Haddam, Conn., that was worn as a charm by the late Dr. Torrey. This stone has dichroic properties; if viewed in one direction it appears blue; if in another, pure white.

The 5-carat titanite or yellow sphene is from the Tavetschthal, in the

Tyrol. This gem shows the play of colors peculiar to the diamond. Specimens have also been found at Bridgewater Station, Pa. There are two long andalusites of 1 and 2 carats' weight, stones which are at times so dichroic that they have been offered in London as Alexandrites; also a square brilliant cut stone of 1 carat. No stones in this collection show the dichroic property to the visitor so perfectly as these, they being so cut as to show the red and green colors at once from the same point of view. These are from Brazil, where fine green ones are also obtained.

Next in order are four light-green diopsides from De Kalb, N. Y., a locality which has yielded 20-carat gems, of rich oil-green color, equal to the 2½ carat cut-stone from Ala., in Piedmont.

A small, long, 1-carat kyanite, from Russia, is noteworthy, as is also the suite of opals, consisting of two noble cut stones, from Hungary, and a polished slab of the light matrix from the same place, beautifully mottled with opalescent spots; a set of over twenty gems, white, yellow, and brown, from Querétaro, Mexico, and two milky opals without the play of colors, from Honduras, an inch and an inch and a half long, respectively; three pieces of blue opal, in the impure brown limonite, or ironstone matrix, from the Baricoo River, Queensland, Australia, termed opaline by the jewelers, and a cut stone from the same locality.

Of turquoise, we have a bluish-green piece 1½ inches long, cut into a flat cabochon stone, from Los Cerillos, New Mex., a fine suite of the mineral in the matrix, recently brought on by Maj. J. W. Powell, from New Mexico, and a set of twenty-four gems from Persia, showing all the characteristic gradations of color between blue and green; a curious three-quarter-inch cabochon cut stone, and a piece 1¼ inches long in the matrix, from Persia, noticeable for the pleasing contrast of the bluish-green stone on the background of chocolate color. A handsome suite, consisting of a 1-inch flat cabochon and seven polished specimens of turquoise in the matrix, from Los Cerillos, New Mex., has lately been deposited by Mr. Thomas Donaldson, of Philadelphia. These vary in color from the malachite-green to the rich light-blue, and in size from 1 by 2 by 3 inches to 3 by 4 by 6 inches.

Hematite is exhibited, cut in the form of a ball and in a cut intaglio. Displayed near these is a cut 1-carat rutile, from Alexander County, N. C. This so closely resembles the black diamond in color and luster as to have been mistaken for it when first found. A large rhodonite, cut *en cabochon*, is on the same pad with these specimens.

A dark, almost black, hypersthene from Norway shows a pleasing bronze-like reflection on the dome of the cabochon, while a polished slab of lighter color is also quite attractive. Chlorastrolite is represented by three small polished pebbles from Isle Royale, Lake Superior. One of the most instructive of the series is a quantity of gem-gravel from Ceylon, containing sapphires of various colors, chrysoberyl, zircon, quartz, and other stones.

A series of the American stone Thomsonite, found as pebbles in the Lake Superior region, presents some fine cut stones, with the circles from one-fourth to three-fourths of an inch across. A few large, polished pieces measure over 1 inch across. Some pebbles of Lintonite, a green variety of Thomsonite from the same locality, are also polished.

The quartz array is very instructive. It begins with a 2½-inch Japanese crystal ball, and an eagle seal 3 inches high, of Russian cutting; a smaller ball and a combination form of the cube and dodecahedron, from Japan, half of a Brazilian pebble, polished, a mounted scarf-pin, cut in cuboidal form, and a small pendant complete the display of rock crystal. Cut citrines, cairngorm, and the so-called smoky, Saxon or Spanish topaz, eleven of the dark-purple amethysts from Siberia, often wrongly called Oriental amethysts, and a set of seven from Brazil show all the changes from light pink to dark purple.

Perhaps the most unique gem of the collection is a piece of amethyst, that was found in Haywood County, N. C., and deposited here by Dr. H. S. Lucas. The present form is just such as would be made by a lapidary in roughly shaping a stone preliminary to cutting and polishing it. It now measures 7 centimeters in length, 6 centimeters in width, 4 centimeters in thickness, and weighs 136.5 grams. It was turtle-shaped when found, and was said to have been worked by pre-historic man. This shape was unfortunately destroyed by chipping it to its present form. It is perfectly transparent, being slightly smoky and pale at one end; it also has a smoky streak in the center. This coloring is peculiar to the amethyst, however. A fine cut amethyst from Stow, Me., represents New England. There are also a three-quarter inch yellowish quartz cat's-eye from Ceylon, a 3-carat green one from Hoff, Bavaria, and a native Indian necklace from Ceylon, composed of numerous yellowish quartz cat's-eye beads of about 3 carats each. There has been recently added to the collection a handsome Siamese ring of cat's-eyes and chip diamonds. The rich gold setting is a model of exquisite Oriental workmanship, the reliefs seeming to have been hammered rather than engraved. The handsome embossed flowers within the ring can not be seen in the case. Its crown is a pyramid, 13 millimeters high and 20 millimeters across the base. The base of the pyramid is surrounded with a row of fourteen cat's-eyes; above this is a row of chip diamonds, while the apex is formed of the largest and finest cat's-eye of the lot. On each side of the crown, on the shank, is a handsome cat's-eye, next in size to the stone which forms the apex.

We have, then, a beautiful series of the brown quartz cat's-eyes, so-called crocidolite cat's-eyes (also called tiger-eyes), in fine slabs, balls, buttons, etc., which is really a combination of crocidolite fibers coated with quartz. This incasing renders it harder than unaltered crocidolite, which is to be seen here together with it. Alongside of these are four handsome stones, cut cabochon, and artificially colored pink, purple, green and gendarme-blue, after the extraction, by a strong acid, of the *original coloring matter* from the quartz casing. All these are from

South Africa. Superb rutilated quartz (sagenite, *fleche d'amour*, Venus-hair-stone, or Love's arrows), in the rough and in cut form, are from North Carolina. Rhode Island contributes black hornblende blades in quartz, and green actinolite in the same (the Thetis-hair-stone of Dr. Jackson). The actinolite, when in straight layers in the quartz, occasionally forms a quartz cat's-eye, if cut across the fibers. The Thetis-hair-stone from Japan is one of the most interesting and beautiful stones in the series of sagenitic quartzes.

The large pieces of black onyx, chrysoprase, carnelian or sard, and sardonyx, and the series of agates, of various colors, numbering over one hundred and fifty specimens, are cut into a variety of forms; the fine 3-inch square slab of "gold quartz," of the jewelers, is from Grass Valley, California.

Fine aventurine quartz, with spangles of mica in a rich reddish-brown quartz, from Russia, vases of which are often worth thousands of dollars, and a fine green aventurine, called imperial jade by the Chinese, and more esteemed by them than any of the true jades, deserve attention. The series of fifteen small Indian mocha-stones is very attractive; the black, moss like markings are relieved by the red spots in the gray body of the stone, thus presenting a surface beautifully diversified. A 6 by 4 inch slab of moss-agate attracts much attention, different people seeing in its markings various bits of fancied scenery. A 2 by 4 inch slab and a circular disk, 1 inch in diameter, are good representative pieces of the blood-stone or heliotrope, so much used in rings and seals. A rich, brown, speckled jasper is worthy of notice. The series of quartzes closes with three polished pieces of silicified wood.

The two cut moldavites (Moravian bottle-glass), about 1 inch across, are of rare occurrence. They are transparent, dark-green obsidians from Moravia, for which worthless green bottle-glass has sometimes been sold. With them are four sleeve-button pieces of opaque obsidian; two black, two red and black, from the Yellowstone National Park.

The two sun-stones from Norway—the largest 1½ inches long, the other a three-quarter-inch cut cabochon—are indeed fine, but a cut stone of the same material from Delaware County, Pennsylvania, the same length as the larger specimen from Norway, is nearly equal to them. A group of fourteen moonstones, of various sizes, from Ceylon, and two from Norway, one a half inches long, the other an inch, make a handsome display, grouped with the sun-stones and smaller labradorites. The last-mentioned species is fully represented, one polished piece being over a foot across, and a number showing the beautiful chatoyant colors to perfection.

Amber—yellow, transparent, and containing flies and other insects—is present in the form of cuff-buttons, a breast-pin and beads; also, in larger pieces, with one side polished, and large "tear-drops," which are especially of educational interest.

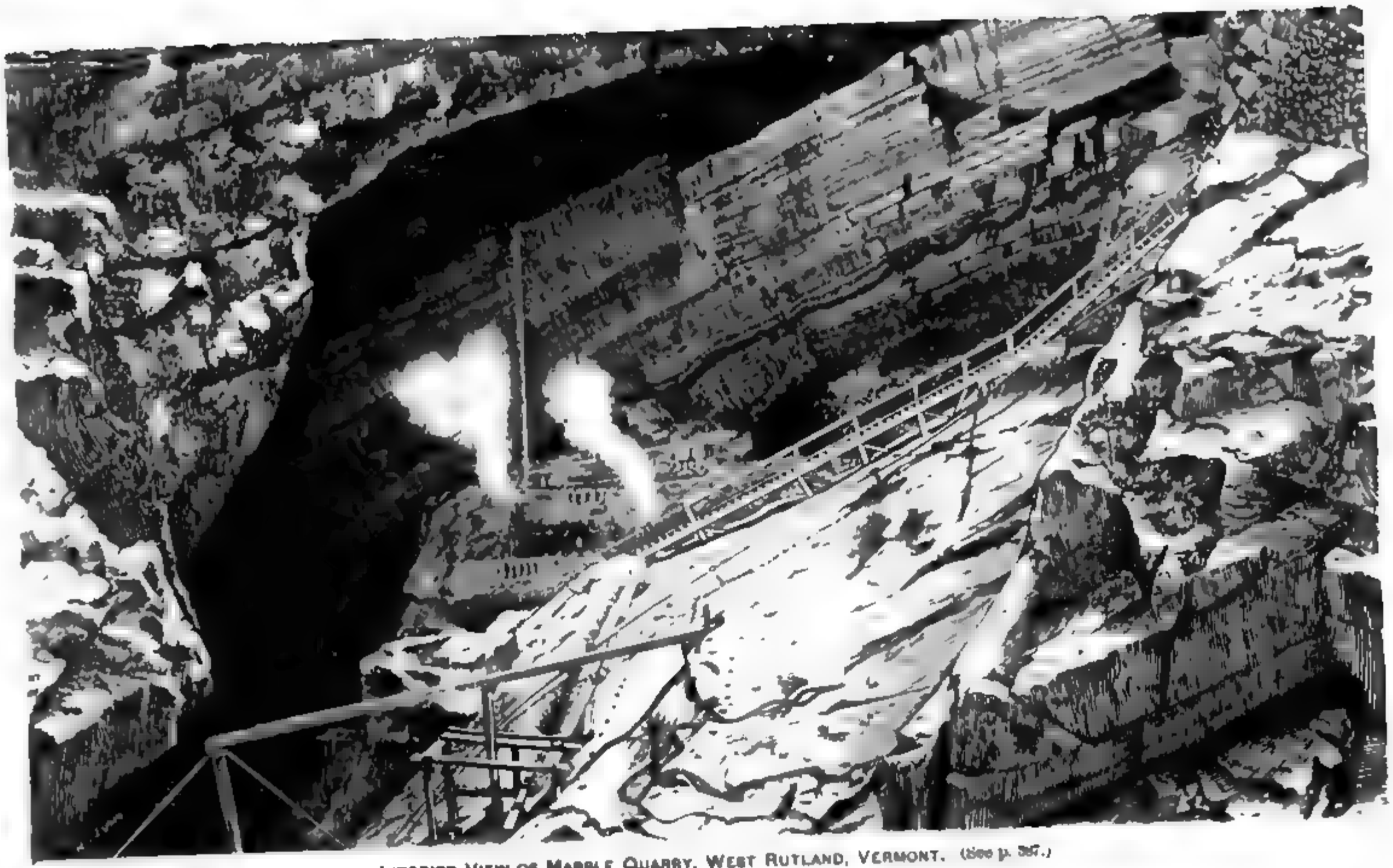
A rich, dark-brown cut aragonite, from California, and the beautiful green copper-colored Smithsonite (a zinc ore) from Laurium, Greece, demand special notice. One is a cut cabochon 1 inch long and one-half inch high, the other an ideal piece of the natural mineral. We observe, also, a fine polished malachite, from Siberia, and a smaller breast-pin piece; also, a dish of the highly-prized dark blue, or, more accurately, dark purple, fluorite from Derbyshire, England, where it is familiarly known as "Blue John." Vases of this material have often been sold for over $1,000. Two small polished pieces of the Persian lapis-lazuli, and a slab 8 inches across, and one 4 inches, of the white-veined variety from the Peruvian Andes, well represent this species. A jade pendant, 3 inches long and of good color, is one of the sort made in Germany to sell in New Zealand, as genuine aboriginal workmanship. Also, a flat vase made of a gray Chinese jade, and one of the small bracelets of the same material, light-green in color, which are put on the arms of girls in early childhood, and allowed to remain there, until the natural growth of the arm fixes them so tightly, that they can not be removed over the hand. To the jades have recently been added an Alaskan jade labret, used by the Alaska Indians as a lip ornament, and a Chinese jade ink-stone holder, mounted on a base of carved teak-wood. This is the most elaborate jade in the collection; the body of a dragon forming a cell for water, the mouth of the cell being a hole in the dragon's back. The beast's fore-paws and head rest upon the edge of a rectangular trough, which is intended to hold the ink-stone. From this he appears to be drinking, while a smaller beast, whose head just appears above the edge at the other end of the trough, watches his powerful enemy with a stealthy, malicious fear.

A rich dark-green flower, 6 inches by 3, chiseled out of serpentine, is very pretty, as is a curious, fanciful, turtle-like talc ornament from Southern India, the shell of which is beautifully carved into a net-work of flowers, and a carved toilet-box of the same material, from the same locality. Besides the serpentine flower, there is a handsome turned vase, 8 inches high, grayish-green, crossed and recrossed with very dark olive-green streaks, giving it a mottled appearance; also a handsome, polished slab of Williamsite from Texas, Lancaster County, Penn., 6 by 10 inches, a small flower ornament from San Francisco, a paper-weight and two massive specimens of green Serpentine, spotted with red, from Cornwall, England, and a polished fancy specimen of Bowenite from Rhode Island. Red, white, and mottled Agalmatolite (Chinese figure-stone), from China, is interesting. There are three carved specimens representing human beings, and another, much more elaborate, representing a parting scene on the sea-shore. The remaining specimen of Agalmatolite is a handsomely-carved tray, on which is represented a typical oriental scene, with all its wealth of luxuriant vegetation. This well-preserved specimen was brought from Japan to Holland by the Dutch merchants in the sixteenth or seventeenth

century, and was recently deposited in the Museum by Mr. G. Brown Goode, the Assistant Secretary.

One of the finest specimens of its kind in the United States is a magnificent 6 by 4 slab of lumachellè ("fire-marble") of fossil origin, in which the color of the original shells is so deepened and intensified that it rivals the finest fire-opal. This comes from the old, exhausted locality of Carinthia, Austro-Hungary. Of alabaster, we have white, yellow, and cinnamon-gray slabs; of fossil coral, a fine slab from Iowa City. The oölite limestone from Bristol, England, is curious; the surface is highly polished, presenting a white field flecked with dark red. Beads of gypsum satin spar and a 3-inch egg of the same material are from Bridgeford, England. A wavy slab of polished light-brown barite, having its surface variegated with dark-brown spots, from Derbyshire, England, is rather interesting. A slab of jet from England, one from Germany, and another from Colorado are exhibited near two handsome carvings in cannel coal from Simpson's coal and lead mine in Missouri. One of these last represents a scene in a coal mine, and the other a bouquet of flowers. A cannon 12 inches long, mounted on truncheons, and an egg-shaped paper-weight, both made of the travertine of Gibraltar, and a small light-green slab of polished stalagmite from Baird, Cal., are among recent additions, as are ten rough, perforated garnets from an ancient grave in Bohemia, and a silver bar-pin, set with bloodstones and agates, the last the gift of Messrs. Harris and Shafer, of Washington.

The collection ends with an 8 by 3 slab of catlinite (Indian pipe-stone) and a large Indian pipe of the same material, from Coteau du Prairie, Pipestone County, Minn. The head delineated on the slab was carved by a Washington sculptor, and came into the Museum with the Abert collection, which was given to the Museum.



INTERIOR VIEW OF MARBLE QUARRY, WEST RUTLAND, VERMONT. (See p. 387.)

THE COLLECTION OF BUILDING AND ORNAMENTAL STONES IN THE U. S. NATIONAL MUSEUM: A HAND-BOOK AND CATALOGUE.

By GEORGE P. MERRILL, *Curator, Department Lithology and Physical Geology.*

PREFATORY NOTE.

The collection of building and ornamental stones in the National Museum is made up very largely from materials received from the Centennial Exposition at Philadelphia in 1876, and from the Tenth Census at the close of the investigation of the quarrying industries of the United States in 1880. By far the greater part and more systematic portion of the collection is from the latter source, and as the late Dr. George W. Hawes, then curator of this Department, was also in charge of that branch of the census work, it may be said to be due to his efforts more than to those of any other individual that the collection has been gotten together. Having once assumed such proportions as to attract national attention, it has been a matter of comparative ease to obtain materials from localities that were but poorly, if at all, represented at the time of Dr. Hawes' death. The present collection comprises upward of 2,900 specimens, a large part of which are from quarries in the United States, though very many foreign varieties are represented. It is the intention to add to it from time to time such new materials as shall be discovered in this country, and also the principal varieties from foreign sources, particular attention being paid to such as are imported into the United States.

In preparing the exhibit the stones have been arranged by States, and under States by kind; this method seeming best adapted to the wants of the general public.

The specimens are as a rule dressed in the form of 4-inch cubes, the various faces of which are finished as follows: Polished in front, drafted and pointed on the left side, drafted rock face on the right side, rock face behind, and smooth-sanded on the top and bottom. Stones that do not polish have the face simply rubbed smooth. When of any other size or shape than that of a 4-inch cube the approximate size is here stated in inches. Each specimen is accompanied by a printed label, giving, so far as obtainable, its scientific name, geological age, color, and

texture, together with the locality from whence it was obtained and the name of the donor or collector.

The data for the accompanying hand-book has been likewise in part supplied by the Tenth Census, in Vol. x, Report on Building Stones and Statistics of Quarrying Industries. So far as possible statements taken from this work have been verified by reference to the original schedules now on file in this Department. The time that has elapsed since the publication of the census report has, however, enabled me to gather much new material, and to supply many facts there altogether omitted. As the work is intended for popular use, it has seemed advisable to go into considerable detail regarding the nature and composition of each class of rocks, stating, so far as possible, the qualities that render them of value for architectural purposes. Indeed it may be said that in putting the matter in its present shape the curator has been guided largely by the character of the requests for information which are being so constantly received. These requests are from persons in all stations of life, but most largely, as a matter of course, from those who are actively employed either in quarrying, building, or dealing in building materials. With such it has rarely been found sufficient to give merely the name of a stone submitted or inquired about, but such details as mineral composition, suitableness for any particular purpose, qualities good and bad, how it differs from other stone with which it may be brought into competition, etc., are almost invariably insisted upon.

Inasmuch as the market value of a stone is so largely dependent upon the cost of quarrying and dressing, it has been deemed advisable to devote a few pages to an explanation or description of the various machines, implements, and methods employed in this work. It is to be understood that none of these machines are actually on exhibition otherwise than by photograph or engraving. Only such are described as have been found by the writer in actual use in the quarries, or which seem sufficiently promising to merit attention.

It is doubtless scarcely necessary to state that the results given in Table 8 were not obtained from tests applied on these individual specimens, nor at the Museum. They are compilations from a variety of undoubtedly reliable sources, and a part of which have never before been published.

In speaking of any particular stone or group of stones it will be observed I have not limited myself to a mere description of the sample as it appears in the Museum collections, but have gone more into detail regarding the quarries from whence it was obtained, its mode of occurrence, use, and the natural facilities for quarrying and transportation. This for the reason that, while many an outcrop is capable of furnishing samples of excellent quality for purposes of exhibition the stone may be practically worthless owing to difficulties in the way of quarrying, lack of transportation facilities, or distance from market.

NATIONAL MUSEUM, *July*, 1887.

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PART I.

INTRODUCTORY.

A.—HISTORICAL AND GENERAL.

The use of any kind of stone for building purposes in the United States, or indeed in America, of necessity dates from a comparatively recent period. The early settlers were too poor and too thoroughly occupied in the struggle for existence to give a thought to other constructive material than wood, and hence it is not surprising that over one hundred years elapsed from the time of the landing of the pilgrims at Plymouth before the first stone structure of importance was erected. As, however, wealth increased, towns became cities, and matters assumed a more permanent aspect, there naturally arose a demand for a more durable and highly ornamental material; for such, fortunately, the early settlers of eastern Massachusetts had not far to look. The first stones quarried in this State are thought by Professor Shaler to have been the clayslates in the vicinity of Boston. These, however, were worked only in a small way and the product used for grave- and milestones, and a few lintels.

Granite came into early use for building purposes, probably more on account of its ready accessibility than from any desire on the part of the people for so refractory a material, the matter of transportation then, as now, being an important item in deciding what material was to be used.

According to Shurtleff* one of the first stone buildings in Boston was the house of Deacon John Phillips, which was erected about 1650, and which continued to stand until 1864. It is supposed to have been built from granite bowlders found in the immediate vicinity. In 1737 was built of bowlders of Braintree granite the old Hancock house, since torn down, and in 1749–'54 King's chapel, which is still standing on the corner of School and Tremont streets. This last was at the time the greatest stone construction ever undertaken in Boston, if not in this country. Like those already mentioned, it was built from bowlders, and considering the method of cutting employed (to be noticed later), was indeed a remarkable structure. The granite bowlders scattered over the commons had been very generally used in Quincy and vicinity

* History of Boston, p. 589.

for steps and foundations for some years previous to this, until at last the inhabitants fearing lest the supply should become exhausted, assembled in town meeting and voted that "no person shall dig or carry off" any stone "on the said commons or undivided lands upon any account whatever without license from the committee, upon penalty of the forfeiture of 10 shillings for every and each cart-load so dug and carried away."

It was not, however, until the early part of the present century that granite began to be used at all extensively in and about Boston, when the material was introduced in considerable quantities by canal from Chelmsford,* 30 miles distant. It was from Chelmsford stone that was constructed in 1810 the Boston court-house; in 1814 the New South church; and about the same time the Congregational house on Beacon street; the old Parkman house on Bowdoin square; University hall in Cambridge; and in 1818–'19 the first stone block in the city, a portion of which is still standing, on Brattle street. In this year also a considerable quantity of the stone was shipped to Savannah, Ga., for the construction of a church at that place. The greater part of this granite was, however, obtained from bowlders, and it was not until the opening of quarries at Quincy, in 1825, that the business assumed any great importance. From this time the use of granite for building material increased in a marked degree, and the history of stone quarrying in Massachusetts may properly begin with this date.

The opening of quarries at Quincy was due very largely to the demand for stone for the construction of the Bunker Hill monument. Prior to this time it is stated not much thought had been given to the quarries of the vicinity, although the business had been carried on in a small way by several parties. The quarry at Quincy from whence the stone for the monument was taken is stated to have been previously purchased by a Mr. Gridley Bryant in 1825 at a cost of $250. This gentleman afterwards sold the same to Mr. Amos Lawrence, acting for the monument committee. The development of this quarry led to the discovery of others in the immediate vicinity, and with slight retardations there has been a gradual increase ever since. It is stated that in 1837 the total amount of stone quarried in the town was 64,590 tons, valued at $248,737, in the production of which some 533 men were employed; in 1845 the value of the total product had increased to $324,500, though the number of men employed was but 526. In 1855 there appears to have been a falling off, since the value of the product for that year was but $238,000, and but 324 men furnished with employment. Twenty-five years later (1880) the census returns for the towns of Quincy and West Quincy show a total of thirty quarries, producing annually not less than 723,000 cubic feet of stone, valued at some $226,940, and giving employment to some 820 men.

* It is stated by Hitchcock, Geol. of Mass., Vol. I, p. 148, that the so-called Chelmsford granite in reality came from Westford and Tyngsborough, in the same State.

In 1824 a Mr. Bates, of Quincy, went to Sandy Hook, in the adjacent town of Gloucester—a town heretofore noted only for its fishery interests—and opened a granite quarry there. Not long after other quarries were opened at Anisquam, where an extensive industry was carried on for some years, though finally abandoned. Quarries were opened at Rockport, just beyond Gloucester, in 1827, and are still in active operation, and doing a profitable business, although the first year's experience is said to have resulted in a net loss of $15.

In 1848 the quarries at Bay View were opened, which have since become the property of the Cape Ann Granite Company, and form now one of the best equipped quarries in the country, producing annually not less than 480,000 cubic feet of stone, valued in the rough at $250,000.

Although the Massachusetts quarries were the first systematically worked to obtain granite for building purposes, other States were not far behind. Thus we are told by Dr. Field* that as early as 1792 granite quarries were reported to have been opened at Haddam Neck, in Connecticut, and as many as ninety hands were employed in this and other quarries in the vicinity as early as 1819. This material is, however, a gneiss rather than a granite, and, splitting readily into slabs, was used nearly altogether for curbing and paving, for which purpose it brought from 10 to 20 cents per cubic foot. The principal markets for the material were Rhode Island and the cities of Boston, New York, Albany, and Baltimore.

The rocky coast and adjacent islands of Maine are competent to furnish for many years immense quantities of granitic rock of a color and quality not to be excelled. The rare excellence of many of these sites for quarries, together with the ready facilities of transportation by water to all the leading cities, early made itself apparent to the shrewd and pushing business men of New England, and a very few years after the commencing of works at Quincy saw similar beginnings made at various points both on the coast and farther inland.

The years 1836–'37 appear, for some reason, to have been peculiarly prolific in schemes for speculation in this industry.

It is stated by North† that during the latter year, out of one hundred and thirty-five acts of incorporation granted by the State legislature, thirty were for granite companies, three of which were located in Augusta. One was called the Augusta and New York Granite Company, and was for working, rending, transporting, and dealing in granite from the Hamlen ledge, situated about 2 miles from the river by way of Western avenue. Another, named the Augusta and Philadelphia Granite Company, owned the Ballard ledge, a mile and a half from Kennebec bridge by way of Northern avenue. A large portion of the granite for the state-house, court-house, and new jail was obtained from this ledge.

* Centennial address and historical sketches of Middletown, Cromwell, Portland, Chatham, and Middle Haddam.

† History of Augusta, Me., p. 582.

The other company, called the Augusta Blue Ledge Company, purchased Hall's ledge, on the east side of the river, near Daniel Hewin's house, some 2½ miles from the bridge.

It is further stated by this same authority* that during the erection of the state-house blocks of granite for the colonnade, 21 feet long by nearly 4 feet in diameter, were obtained from the "Melvin ledge," in Hallowell, about 3 miles away. Convenient and abundant as are these quarry sites, it seems a little singular that they should not have been earlier discovered and worked. In building the Kennebec bridge in 1797 the piers and abutments were constructed of stone split from drift bowlders, and the houses of Capt. William Robinson, Judge Bridge, and Benjamin Whitwell, built about 1801, had for underpinning granite brought at great expense from near Boston, probably Quincy, or perhaps Chelmsford. Most of the stone of large dimensions of which the old jail was built in 1808 were also, it is stated, obtained with great labor from bowlders, though an unsuccessful attempt was made to work the Rowell ledge at the time. Some of the top strata were broken off by means of wedges driven under the sheets, but the process was laborious and slow. The first successful attempt to work a ledge in town is stated to have been made by Jonathan Matthews on the Thwing ledge, in 1825. Powder was not used until the state-house was built, and then at first with only one hole, by means of which irregular masses were thrown out. Later two holes short distances apart were fired simultaneously, by means of which long, straight seams were opened. These seams were again charged with powder, and thus masses of stone of considerable size were moved from the bed to be afterwards broken up by wedges. The Frankfort Granite Company, located at the base of Mosquito Mountain, began operations in May, 1836, and within the next two years took out and sold upwards of $50,000 worth of material. What is now the Hallowell Granite Company opened its quarries in 1838, and during the first ten years is stated to have sold $500,000 worth of stone.

It is stated by Professor Seely† that the earliest attempts at quarrying marbles in New England were those of Philo Tomlinson, who began operations at Marbledale, in the town of New Milford, Conn., about 1800. Other quarries were soon after opened, and in 1830 as many as fifteen were in active operation within a distance of 3 miles. The product was sent to all parts of the country. Soon after this date competition set in from other localities, particularly from Dover, N. Y., and Rutland, Vt., and by 1850 the business had proved so unremunerative that the last quarry at Marbledale was abandoned. Marble quarries and mills were also put in active operation at West Stockbridge, in Massachusetts, as early as 1802 or 1803, and these furnished the marble for the city hall in New York City. Work was stopped here in 1855, owing to competition of Vermont and Italian marbles.

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*Op. cit., p. 582.

†Marble Border of New England, p. 27.

Of the many marble quarries in Vermont, those in East Dorset are believed to have been longest worked, Professor Seely stating one Isaac Underhill began operations here as early as 1785, the product being utilized for fire jams, chimney backs, hearths, and lintels. Other quarries soon opened, and from 1785 to 1841 nine were in operation at this place. The first marble gravestone ever finished in the State is believed to have been the work of Jonas Stewart in 1790. Prior to the introduction of Italian and Rutland marble, about 1840, the supply of the Dorset stone was not equal to the demand.

At West Rutland, which is now the great marble producing center of the country, works were first put in successful operation about 1838. At the present time not less than fifteen quarries are in operation, affording employment altogether to about 2,000 men.

The first stone quarried and used in Philadelphia is said to have been the micaceous and hornblendic gneiss which occurs in inexhaustible quantities in the immediate vicinity. This was at first used only for foundations and rough construction. The first house built within the city limits, if not the first in the State, that built in Letitia court by order of William Penn, was constructed on a foundation of this stone about the year 1682. The Old Swedes church, built in 1698, Independence Hall, and numerous other structures are said to have had similar foundations. Later, entire walls were made of this material, as in the house of John Penn, erected in 1785, and which is still standing.

The quarrying of marble in Montgomery County, Pa., is said to have been commenced by a Mr. Daniel about the time of the Revolution.* This stone seems to have immediately become a favorite for trimming purposes, and to have been used in Philadelphia to the almost entire exclusion of other material until as late as 1840. During this time many fine buildings were constructed from it, as will be noted later.

Sandstone quarrying in the United States doubtless began with the itinerant working of the extensive beds of Triassic brownstone in the vicinity of Portland, Conn. It is stated† that the first quarry here was opened "where the stone originally rose high and hung shelving over the river." The value of the material was early recognized, and it began to be utilized for building and for monuments soon after the settlement of Middletown on the opposite side of the stream. The quarries were at this time regarded as common property, and were worked as occasion demanded both by people in the immediate vicinity and by those living at a distance, who carried off the material in scows or boats of some sort, nor thought of giving anything as an equivalent. This system of free quarrying had assumed such proportions as early as 1665, that on September 4 of that year the citizens of Middletown assembled in town meeting and voted "that whoever shall dig or raise stone at ye rocks on the east side of the river (now Portland) for any

* First Geol. Survey Penna., Vol. 1.

† Centennial Address and Historical Sketches of Middletown, Cromwell, Portland, Chatham, and Middle Haddam, by D. D. Field, 1853.

without the town, the said digger shall be none but an inhabitant of Middletown, and shall be responsible to ye towne twelve pence pr. tunn for every tunn of stones that he or they shall digg for any person whosoever without the towne; this money to be paid in wheat and pease to ye townsmen or their assigns for ye use of ye towne within six months after the transportation of the said stone."*

How soon the surface rock was exhausted and it became necessary, as now, to go below the level of the ground for suitable material is not stated, but the quarry thus opened was at length disposed of by the town and passed through various hands, among whom the names of Shaler & Hall are conspicuous. These parties pursued the business vigorously and made a handsome profit. For several years between 1810 and 1820 some thirty hands were employed for the eight months comprising the quarrying season, and from four to six teams. Some 50 rods south of this quarry another was opened about 1783, and was owned by Messrs. Hulburt & Roberts. About 1814 this was purchased from the heirs of Aaron Hulburt and deeded to Erastus and Silas Brainard, who carried on the business conjointly until the death of the latter in 1847. The business is carried on under the name of Brainard & Co. to the present time. For some five years after this firm began work they employed but from seven to ten hands and two yoke of oxen. In 1819 a quarry was opened north of the Shaler & Hall quarry by the firm of Patten & Russell. It was afterwards known as the Russell & Hall quarry, and finally in 1841 was united with that of Shaler & Hall, the firms combining to form the Middlesex Quarry Company. Some years later still another opening was made below the Brainard quarry near the ferry between Portland and Middletown. This also was known as the Shaler & Hall quarry; the original firm by this name having been incorporated with the Middlesex Quarry Company.

The three firms above enumerated continue to monopolize the quarrying industry at this place. The quarries extend from a point near the ferry northward along the river for some three-fourths of a mile, and vary in depth from 50 to 150 feet. Their yield of stone of all grades during the time of their operation has been roughly estimated at 4,300,000 cubic feet. The rate of progress is given as follows: In 1850 the number of men employed at the three quarries was about 900 and 100 yoke of oxen; thirty vessels being regularly employed to convey the quarried material to the markets, each vessel conveying from 75 to 150 tons and making from twenty to thirty trips each season. Two years later the number of workmen regularly employed had increased to 1,200, while 200 more were engaged on contract work. The stone, even at this date, had found its way to markets as far west as Milwaukee and San Francisco. The census returns for 1880 showed the total number of men employed to be but 925, with 80 yoke of oxen and 55 horses and mules. The falling off in numbers may doubtless be considered due to

* Freestone Quarries of Portland, Conn., by Prof. J. Johnson, Nat. Mag., 1853, p. 268.

the introduction of machinery and improved methods of working. The total product of the three quarries for this year was about 781,600 cubic feet, valued at not less than $650,000. A fleet of twenty-five vessels of various kinds was regularly employed in transporting this material to market.

The quarrying of slate for roofing purposes is an industry of comparatively recent origin in the United States, few of the quarries having been operated for a longer period than twenty or thirty years. The earliest opened and systematically worked are believed to have been those at West Bangor, Pa., which date back to 1835.

The abundance of slate tombstones in many of our older church-yards, however, would seem to prove that for other purposes than roofing these stones have been quarried from a much earlier period. It is stated, moreover, that as early as 1721 a cargo of 20 tons of split slate was brought to Boston from Hangman's Island, in Braintree Bay, which may have been used in part for roofing purposes; but the greater part of the material for this purpose was imported directly from Wales. It is also stated* that slates were quarried at Lancaster, Massachusetts, as early as 1750 or 1753, and were in extensive use in Boston soon after the close of the Revolution. The old Hancock house on Beacon street, already noted (ante, p. 000), was covered with slate from these quarries, as was also the old State House and several other buildings. This quarry was worked more or less for fifty years and formed at one time quite an important industry, but which finally became unprofitable, and about 1825 or 1830 the works were discontinued, not to be again started till about 1877.

The first quarry opened in what is now the chief slate-producing region of the United States was that of Mr. J. W. Williams, situated about a mile northwest of Slateford, in Pennsylvania. This dates back to the year 1812.†

The Vermont slate quarries are of still more recent development, work not being begun here till 1845, when Hon. Alason Allen began the manufacture of school slates at Fairhaven.‡

It is interesting to note, in this connection, that during the business depression of 1876–'80 almost the entire product of the American quarries was exported to England, where it sold for even less than the Welsh slates, though necessarily at very small profits. The return of more prosperous times, however, created a local demand, and the export trade has proportionally decreased, though considerable quantities are still sent to the West Indies, South America, England, Germany, and even New Zealand and Australia.

At present not far from $3,328,150 are invested in the slate quarries of the United States, and the value of the annual product is some $1,529,985.

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* Marvin's History of Lancaster, Mass.

† Rep. D. 3, second Geol. of Penna., p. 85.

‡ Geol. of Vt., Vol. II, 1861, p. 791.

B.—THE MINERALS OF BUILDING STONES.

Rocks are mineral aggregates. As a rule the number of mineral species constituting any essential portion of a rock is very small, seldom exceeding three or four. In common limestone, for instance, the only essential constituent is the mineral calcite; granite, on the other hand, is almost invariably composed of minerals of at least three independent species. Upon the character of these minerals and the amount of their cohesion is dependent, to a very considerable extent, the suitability or desirability of any stone for architectural purposes. Microscopic examination will usually result in increasing the apparent number of mineral species, and it not infrequently happens that those present, even in minute quantities, are of great economic importance.

In the arrangement here adopted rock-forming minerals are divided into four classes: (1) Essential; (2) accessory; (3) original; (4) secondary.

(1) The essential minerals are those which form the chief ingredients of any rock, and which may be regarded as characteristic of any particular variety; *e. g.*, quartz is an essential constituent of granite; without the quartz the rock becomes a syenite.

(2) The accessory minerals are those which, though usually present, are of such minor importance that their absence does not materially effect the character of the rock; *e. g.*, mica, hornblende, apatite, or magnetite, are nearly always present in granite, yet a rock in which any or all of these are lacking may still be classed as a granite. The accessory mineral which predominates is called the *characterizing* accessory and gives its name to the rock. Thus a biotite granite is one in which the accessory mineral biotite prevails.

(3) The original constituents of a rock are those which formed upon its first consolidation. All the essential constituents are original, but all the original constituents are not necessarily essential. Thus, in granite, quartz and orthoclase are both original and essential, while beryl and sphene, though original, are not essential.

(4) Secondary constituents are those which result from subsequent changes in a rock, changes due usually to the chemical action of percolating water. Such are the calcite, chalcedony, quartz, and zeolite deposits which form in the drusy and amygdaloidal cavities of traps and other rocks.

In the following list is included all those minerals which ordinarily occur in such of our rocks as are used for building or ornamental purposes. In the first column are given those which compose any appreciable part of the rocks, and any one of which may at times become the principal ingredient or characterizing accessory. The second column contains those which, if present at all, occur only in small quantities:

1. Quartz.
2. Feldspar.
   - Orthoclase.
   - Microcline.
   - Albite. } Plagioclase.
   - Anorthite. } Plagioclase.
   - Labradorite } Plagioclase.
   - Andesite. } Plagioclase.
   - Oligoclase. } Plagioclase.
3. Mica.
   - Muscovite.
   - Biotite.
   - Phlogopite.
   - Lepidomelane or Annite.
4. Amphibole.
   - Tremolite.
   - Actinolite.
   - Common hornblende.
5. Pyroxene.
   - Malacolite.
   - Sahlite.
   - Augite.
   - Diallage.
   - Enstatite.
   - Hypersthene.
6. Olivine.
7. Epidote.
8. Elaeolite.
9. Calcite.
10. Aragonite.
11. Dolomite.
12. Gypsum.
13. Serpentine.
14. Talc.
15. Chlorite.

ELEMENTS.

Carbon.
Graphite.

SULPHIDES.

Galenite.
Sphalerite.
Pyrite.
Marcasite.

CHLORIDES.

Halite (common salt).

FLUORIDES.

Fluorite (fluor-spar).

OXIDES.

Trydimite.
Hematite (specular iron).
Menaccanite (titanic iron).
Magnetite (magnetic iron).
Chromite (chromic iron).
Limonite (hydrous iron oxide).
Rutile.

ANHYDROUS SILICATES.

Acmite.
Beryl.
Danalite.
Garnet.
Zircon.
Zoisite.
Allanite.
Scapolite.
Sodalite.
Tourmaline (shorl).
Titanite (sphene).

HYDROUS SILICATES.

Laumontite.
Natrolite.
Analcite.
Chabazite.
Stilbite.
Kaolin.

PHOSPHATES.

Apatite.

CARBONATES.

Ankerite.
Siderite.

As these are all fully described in the numerous works on mineralogy it is not deemed necessary to enter into any elaborate discussion of their properties here, excepting in the case of those few which from their abundance, or from other causes, have a pronounced effect upon the rocks in which they occur.

QUARTZ.—*Chemical composition :* Pure silica, SiO_2. Hardness, 7.*

This is one of the commonest minerals of the earth's crust, and is an essential constituent of granite, gneiss, mica schist, quartz porphyry, liparite, quartzite, and ordinary sandstone, occurring in the form of crystals, crystalline grains, and fragments of crystals. It is usually easily recognized by its clear, colorless appearance, irregular, glass-like fracture, hardness, and entire insolubility in acids. Its hardness is such that it scratches glass, and in this respect alone it differs from any other of the essential constituents. It is, however, brittle, and hence, though the hardest mineral, is by no means the most refractory; stones like granite, which are rich in quartz, working more easily than the trap-rocks, in which it is, as a rule, entirely lacking.

Although ordinarily one of the most indestructible of minerals, and infusible in the hottest flame of the blow-pipe, yet highly quartzose rocks like granite are by no means fire-proof, but scale badly when subjected to the heat of a burning building. This peculiar susceptibility of the rock to heat is thought by some to be due to the microscopic fluidal cavities which exist in the quartz, and which are at times exceeding abundant.

THE FELDSPARS. Hardness, 5 to 7.

The feldspars are essentially silicates containing alumina together with potash, soda, or lime. There are six varieties that are common constituents of building stones, viz, orthoclase, microcline, albite, oligoclase, labradorite, and anorthite. Of these, albite, oligoclase, labradorite, and anorthite are usually indistinguishable from one another by the eye alone, especially in fine-grained rocks, and are therefore designated by the convenient term *plagioclase feldspars* or simply *plagioclase.* Orthoclase is the prevailing feldspar and most important constituent in granites and gneisses, and is usually accompanied by albite

*For convenience in determining minerals the "scale of hardness" given below has been adopted by mineralogists. By means of it one is enabled to designate the comparative hardness of minerals with ease and definiteness. Thus, in saying that serpentine has a hardness equal to 4 is meant that it is of the same hardness as the mineral fluorite, and can therefore be cut with a knife or other tool, but less readily than calcite or marble.

1. *Talc.*—Easily scratched by the thumb-nail.
2. *Gypsum.*—Can be scratched by the thumb-nail.
3. *Calcite.*—Not readily scratched by the thumb-nail, but easily cut with a knife.
4. *Fluorite.*—Can be cut with a knife, but less easily than calcite.
5. *Apatite.*—Can be cut with a knife, but only with difficulty.
6. *Orthoclase feldspar.*—Can be cut with a knife only with great difficulty and on thin edges.
7. *Quartz.*—Can not be cut with a knife; scratches glass.

or oligoclase, or frequently microcline. Anorthite and labradorite are equally important constituents of basic eruptive rocks, such as diabase, basalt, and andesite.

The physical condition of the feldspar in a building stone is a matter of the greatest importance. In those rocks which withstand the effect of the weather through long periods of years without change or disintegration, the feldspars, if examined with a microscope, will be found hard, compact, and fresh, containing but few cavities or impurities. On the other hand, the feldspars of many rocks, if thus examined, will be found filled with minute cavities and flaws which are often so filled with impurities and products of decomposition as to be quite opaque (Hawes). Such rocks will not for any length of time withstand the weather, since infiltrating waters containing minute quantities of carbonic and other acids, aided by heat and frost, can not fail to produce the dire result of disintegration.

The feldspars have also an important influence upon the cutting of a stone. The hardness and toughness of many granites and other crystalline siliceous rocks are due, not to the hard and brittle quartz, but to the feldspathic constituent, which is quite variable. The soft granites consist of the same constituents, but the feldspars are porous and therefore offer less resistance to the cutting tool. The feldspars also possess a distinct cleavage, that is, they split or cleave in one or two directions much more readily than in others. It therefore, sometimes happens, especially in coarse-grained and porphyritic rocks, that it is very difficult to obtain the perfect surface necessary for polishing, since little particles of the feldspars are constantly splitting out, leaving small cavities or "nicks."

The color of a rock frequently depends largely upon its feldspathic constituent. If the feldspar be clear, transparent, and glassy, the light enters it and is absorbed, giving to the stone a dark color, as is the case with the Quincy granites and many quartz porphyries and diabases. If the feldspar is soft and porous, the light is reflected from the surface and the rock appears white. In all the pink and red granites and gneisses the color is due to the pink and red orthoclase they contain. It sometimes happens that the orthoclase and plagioclase—when both are present in the same rock—are differently colored, the orthoclase being pink or red, while the plagioclase is nearly white.

THE MICAS. Hardness 2.5 to 3.

Two kinds of mica occur as prominent constituents of building stones, especially the granites and gneisses.

These are black mica or biotite, and white mica or muscovite. Both kinds occur in small shining scales which are sometimes hexagonal in outline, though more frequently of quite irregular form.

The composition of the micas is complex, but the black variety is essentially a silicate of iron, alumina, magnesia, and potash, while the

white variety is a silicate of alumina and potash with small amounts of iron, soda, magnesia, and water.

The kind, amount, and disposition of mica in a building stone has a very important bearing upon its working and weathering qualities as well as general fitness for architectural purposes. If it occurs in any abundance and the folia are arranged in parallel layers the rock splits much more readily in a direction parallel to the mica laminæ than in that at right angles to them. Mica is itself moreover "soft and fissile, and hence is an element of weakness." It also receives a polish only with difficulty and which is soon lost upon exposure to the weather. Black mica, moreover, owing to its large percentage of iron, is liable to succumb to atmospheric agencies.*

The finest grades of building stone should contain mica only in small flakes, and these evenly distributed throughout the mass of the rock.

From the marked contrast in color of the two micas it follows that they have a decided influence upon the color of the rock containing them. Folia of black mica in any abundance naturally give the rock a dark-gray hue, while the white mica, being nearly colorless, has a neutral effect. Hence, other things being equal, muscovite granites are much lighter in color than those in which biotite is the characterizing accessory.

Other micas common in such stone as are used for building are lepidomelane and phlogopite. The first of these is black in color and closely resembles biotite, from which, however, it differs in containing smaller proportions of the protoxide of iron and in the folia being opaque and inelastic. For all practical purposes this mica is, however, identical with biotite, and no distinction has been attempted in the present work. Phlogopite is colorless like muscovite, from which it can often be distinguished only with difficulty. It is a common constituent of many limestones, dolomites, and serpentinous rocks.

AMPHIBOLE. **Hornblende.** Hardness, 5 to 6.

Two principal varieties of this mineral are recognized: (1) The non-aluminous, including the white, gray, and pale green, often fibrous forms as tremolite, actinolite and asbestus, and (2) the aluminous, which includes the dark-green, brown, and black varieties. The aluminous variety, common hornblende, is an original and essential constituent of diorite, and of many varieties of granite, gneiss, syenite, schist, andesite and trachyte, and is also present as a secondary constituent in many rocks, resulting from the molecular alteration of the augite. The

* Dr. P. Schweitzer while studying the superficial decomposition of the gneiss of New York Island, discovered that the black mica, after getting first coated with a brown film of oxide of iron, "rapidly disintegrated and disappeared," while the white mica possessing greater powers of endurance remains fresh and intact.—Chem. News, IV, 1874, p. 444.

The same phenomena may be noticed in the mica schists about Washington, D. C.

non-aluminous varieties occur in gneiss, crystalline limestone, and other metamorphic rocks.

The hornblende in such rocks as are used for building purposes can be readily recognized by its dark-green or almost black color and the compactness and tenacity of its crystals which are not easily separable into thin leaves or folia as is black mica, with which it might otherwise be confounded. Hornblende acquires readily a good and lasting polish and as the mineral itself is strong and durable, its presence in a rock is thought to be preferable to that of mica.

THE PYROXENES. Hardness, 5 to 6.

Two principal varieties of this mineral are recognized, as with the amphiboles, (1) the non-aluminous, including the light-colored varieties malacolite, sahlite, and diallage, and (2) the aluminous, including the dark variety, augite.

The lighter-colored non-aluminous varieties, malacolite and sahlite, are common in mica and hornblendic schists, gneiss, and granite, though seldom in sufficient abundance to be noticeable to the naked eye. The foliated variety, diallage, is an essential constituent of the rock gabbro, and is also common in serpentine. The darker-colored aluminous variety, augite, is an essential constituent of diabase and basalt, and also occurs in many syenites, andesites, and other eruptive rocks.

In such rocks as are used for building purposes the pyroxene can not usually be distinguished by the unaided eye from hornblende. With the exception of the Quincy granites and the New Castle, Del., gneisses, pyroxenes do not occur in any of our granitic rocks now quarried, but in the diabases and basalts the augite is a very important constituent. It is usually a compact and tough yellowish-green or nearly black mineral, and, like hornblende, readily acquires a good and lasting polish. The pyroxene of the Quincy granite, however, proves an exceptionally brittle variety, and the continual breaking away of little pieces during the process of dressing the stone makes the production of a perfectly smooth surface a matter of great difficulty.

CALCITE. Calc-spar.—*Composition:* Calcium carbonate, $CaCO_3$ = carbon dioxide, 44 per cent.; lime, 56 per cent. Hardness, 3.

This is an original constituent of many rocks, such as limestone, ophiolite, and calcareous shale, and is the essential constituent of most marbles, of stalactites, travertine, and calc-sinter. It also occurs as a secondary constituent resulting from the decomposition of other minerals, filling wholly, or in part, cavities in rocks of all ages, such as granite, gneiss, syenite, diabase, diorite, liparite, trachyte, andesite, and basalt.

Calcite when pure is white in color, and soft enough to be cut with a knife. It can be readily distinguished from other minerals (excepting aragonite) by its brisk effervescence when treated with a dilute acid.

ARAGONITE.—*Composition:* Same as calcite. Hardness, 3.5 to 4.

This mineral has the same chemical composition as calcite, but differs in its crystalline form and specific gravity. It sometimes occurs in deposits of sufficient extent to be quarried as marble. The beautiful "onyx marble" of San Luis Obispo is nearly pure aragonite.

DOLOMITE.—*Composition:* $(CaMg)CO_3$ = Calcium carbonate, 54.35 per cent.; magnesium carbonate, 45.65 per cent. Hardness, 3.2 to 4.

This mineral closely resembles calcite, but can be readily distinguished from the same by its greater hardness and from its being acted upon but little, if at all, by a dilute acid. Like calcite, it frequently occurs in compact crystalline massive forms, and is quarried for building material or for making lime. Many of our marbles are dolomites, as for instance those of Cockeysville, Md., and Pleasantville, N. Y.

GYPSUM. Calcium Sulphate.—*Composition:* $CaSO_4 + 2aq$ = sulphur trioxide, 46.5 per cent.; lime, 32.6 per cent.; water, 20.9 per cent. Hardenss, 2.

Gypsum rarely occurs in crystalline rocks, but forms extensive beds among stratified rocks such as limestones and beds of clay. The fine translucent variety is used for ornamental purposes, and is known as alabaster. It is soft enough to be readily cut with a knife or scratched with the thumb-nail, and it is not at all acted on by acids. It is therefore readily distinguished from calcite, which it somewhat resembles.

SERPENTINE.—*Composition:* A hydrous silicate of magnesia, $Mg_3Si_2O_7 + 2aq$ = silica, 43.48 per cent.; magnesia, 43.48 per cent.; water, 13.04 per cent. Hardness, 4.

This mineral occurs mixed with calcite or dolomite, forming the so-called verdantique marble or ophiolite. As a secondary product it is sometimes found resulting from the alteration of olivine and other magnesian minerals in various eruptive rocks, such as basalt, diabase, dunite, and lherzolite. It often occurs in extensive deposits, usually mixed with more or less chromite, magnetite, enstatite, or similar minerals, and is of value as a building or ornamental stone, as will be noticed later.

Serpentine can usually be recognized from its green or yellowish color, slightly soapy feeling, lack of cleavage, and softness, it being readily cut with a knife. It is, however, not so soft as talc, with which it might possibly be confounded by any but a mineralogist.

TALC. Steatite.—*Composition:* A hydrous silicate of magnesia = silica, 63.49 per cent.; magnesia, 31.75 per cent.; water, 4.76 per cent. Hardness, 1.

This is a common mineral, occurring as an essential constituent of talc schist or as an alteration product, replacing hornblende, augite, mica, and other magnesian minerals. The common form is that of small, greenish, inelastic scales. It often occurs massive, and is known by the name of soapstone, and is used extensively in stoves and furnaces. The finely *granular crypto-crystalline* variety is known as *French chalk*, used by tailors and others. In its common form this mineral might be mistaken for a mica, but for its soapy feeling and softness, *which is such that* it can be readily scratched by the thumb-nail.

OLIVINE. Chrysolite. Peridot.—*Composition*: Silicate of lime and magnesia. *Hardness*, 6 to 7.

Olivine is an essential constituent of basalt, dunite, limburgite, lherzolite, and picrite, and is a prominent ingredient of many lavas, diabases, gabbros, and other igneous rocks, where it occurs in the form of rounded blebs of a bottle-green color. It also occurs occasionally in metamorphic rocks and is a constituent of many meteorites. Olivine is subject to extensive alteration, becoming changed into serpentine. Many beds of serpentine result entirely from the alteration of olivine-bearing rocks.

GARNET.—*Composition*: Variable; essentially a silicate of alumina, lime, iron, or magnesia. *Hardness*, 6.5 to 7.5.

This mineral is an abundant accessory in mica schist, gneiss, granite, crystalline limestone, and occasionally in serpentine, volcanic tuff, and lava.

The presence of garnets in stones designed for finely finished work is always detrimental, since, owing to their brittleness and hardness, they break away from the stone in the process of dressing and render the production of smooth surfaces a matter of difficulty. Those garnets which are found in such stone as are used for building are nearly always of a red color and rounded form.

EPIDOTE.—*Composition*: Silica, 37.83 per cent.; alumina, 22.63 per cent.; iron oxides, 15.98 per cent.; lime, 23.27 per cent.; water 2.05 per cent. *Hardness*, 6 to 7.

This mineral is a common constituent of many granites, gneisses, and schists, especially the hornblendic varieties. It is also found as a secondary constituent in the amygdaloidal cavities of many trap rocks, and is readily recognizable from its green color. Although a common constituent in small proportions of many rocks, those cases in which it is sufficiently abundant to give them a specific character are extremely rare. Certain of the New Hampshire and Massachusetts granites contain it in such quantities as to be recognizable as greenish specks on a polished surface, as does also the melaphyr quarried at Brighton, in the latter State.

CHLORITE. Viridite.—*Hardness*, 2 to 3.

Under the general name chlorite are included several minerals occurring in fibers and folia, closely resembling the micas, from which they differ in their large percentage of water, and in their folia being inelastic. The three principal varieties recognized are ripidolite, penninite, and prochlorite, any one of which may occur as the essential constituent of a chlorite schist. Chlorite as a secondary product often results from and entirely replaces the pyroxene, hornblende, or mica in rocks of various kinds, and also occurs filling wholly or in part the amygdaloidal cavities of trap rocks. In this form it is frequently visible only with the microscope, and owing to the difficulties in the way of an exact determination of its mineral species is called *viridite*, from the Latin

viridis, green, this being its usual color. The characteristic greenness which gave the name *greenstone* to the diorites and diabases is due in large part to the secondary chlorite contained by them.

IRON PYRITES.—*Composition:* Iron disulphide, FeS_2 = sulphur, 53.3 per cent.; iron, 46.7 per cent. *Hardness*, 6 to 6.5.

A very common accessory in rocks of all kinds and all ages, usually occurring in small cubes or irregular masses of a brassy yellow color.

It may be set down as a rule that rocks containing this mineral should not be used for ornamental work that is to be exposed to the weather, since it is very liable to oxidation in time, staining the stone and perhaps causing the more serious result of disintegration. This form of the iron disulphide is, however, less objectionable than that known as *marcasite* or the gray iron pyrites.

For some unexplained reason this form of the mineral decomposes even more readily than the pyrite, and hence its presence is always to be avoided in all rocks where permanency of color or durability is desired.

A microscopic study of pyrite-bearing rocks has shown that there are many important considerations bearing upon the weathering properties of this mineral. Thus it is found, as in many of the Ohio limestones and dolomites, occuring not only in well-defined cubes of a brassy yellow color, but also in an amorphous granular condition in a very fine state of subdivision which appears almost black under the microscope. Experience has shown that in the latter form it is much more liable to oxidation than when in cubes, and hence we see the necessity of a microscopic examination of a stone as one of the guides to its probable weathering qualities. In this finely amorphous condition the pyrite is stated by Hawes to have an important effect upon the color of the stone. Thus the Springfield and Covington (Ohio) dolomites present in different layers two well-defined colors—a blue and a yellow. An examination with the microscope shows that they differ only in that the blue variety contains the pyrite in the finely disseminated unoxidized state, while in the yellow it has become changed into the hydrous oxide. This change having taken place while the stone lies in the quarry, is unaccompanied by results of a serious nature, unless the uniform change in color be so considered. Had the change taken place in the quarried stone after being laid in the walls of a building, the results would in all probability have proved more undesirable. Pyrite when imbedded firmly in rocks of a close, compact nature is less liable to oxidation than when contained in one of a loose and porous texture. In the magnesian limestones of Dayton, Ohio, the microscope reveals many minute cubes of pyrite which are imbedded so firmly in its mass as to be not at all deleterious, since beyond the reach of atmospheric agencies. In many close-textured rocks, as the slates, pyrite is proverbially long-lived, and hence as a rule we can only regard it with suspicion, as an

ingredient whose presence can result in little that is good and perhaps a great deal that is bad. It should be noted that pyrite on decomposing, may give rise to sulphates and perhaps to free sulphuric acid, which in themselves aid in the work of disintegration.

"In limestones or dolomites the presence of iron pyrites operates disastrously; for, if magnesia be present, the sulphuric acid from the decomposing iron pyrites produces a soluble efflorescent salt, which exudes to the surface and forms white patches, which are alternately washed off and replaced, but leaving a whitened surface probably from the presence of sulphate of lime. If the limestone be entirely calcareous, the salt formed (a sulphate of lime) is insoluble, and therefore produces less obvious results. In some cases, however, the lime of which the mortar or cement is made may contain magnesia, and the decomposition of the iron pyrites in the adjacent stone produces an efflorescent salt which exudes from the joints. This condition is not unfrequently observed in buildings constructed of the bluestone of the Hudson River group. As an example, we may notice the efflorescent patches proceeding from some of the joints between the stones of St. Peter's Church, on State street, in Albany."*

MAGNETITE. Magnetic Iron Ore.—*Composition:* $FeO+Fe_2O_3$ = iron sesquioxide, 68.97 per cent.; iron protoxide, 31.03 per cent. Hardness, 5.5 to 6.5.

This occurs as an original constituent in many schists and granites; in the latter usually in minute crystals visible only with the microscope. It is almost invariably present in igneous rocks such as diorite, diabase, and basalt. When present in considerable quantities it sometimes becomes converted entirely into the sesquioxide of iron through taking oxygen from the the atmosphere. It then stains the rock a rusty red color, as is observable in many diabases.

HEMATITE. Specular Iron Ore.—*Chemical composition:* Anhydrous sesquioxide of iron, Fe_2O_3,= iron, 70.9 per cent.; oxygen, 30.20 per cent.

This mineral occurs in varying proportions in rocks of all ages. In granite it usually occurs as minute scales of a blood-red color. In the amorphous form it often forms the cementing material of sandstones, when it imparts to them a red or reddish-brown color. This form of iron oxide is, however, less common as a cementing substance than the hydrous sesquioxides *turgite* and *limonite*, which are the forms occurring in the Triassic sandstones of the eastern United States.†

* Hall. Report on Building Stone, p. 50. The white efflorescence so frequently seen on stone and brick buildings, seems, according to good authorities, to be, in most cases, due to the mortar in which the stone is laid, and is not an inherent quality of the stone itself. The subject is, therefore, not more fully dwelt upon in the present work.

† Julien, Proc A. A. A. S., 1878.

C.—PHYSICAL AND CHEMICAL PROPERTIES OF ROCKS.

A little space may be well devoted here to a consideration of those properties of rocks which can be grouped under the heads of density, hardness, and structure, together with notes on their color and chemical composition.

(1) DENSITY AND HARDNESS.

Density.—This is an important property, since upon it are dependent to a large extent the weight per cubic foot, the strength, and the absorptive powers of the stone. Among rocks of the same mineral composition, those which are the densest will be found heaviest, least absorptive, and usually the strongest.

To ascertain the weight of a rock it is customary to compare its weight with that of an equal bulk of distilled water, in other words to ascertain its specific gravity. The specific gravity multipled by 62.5 pounds (the weight of a cubic foot of water) will thus give the weight per cubic foot of stone. The weights given in the tables have been thus computed. (See p. 000.)

Hardness.—The apparent hardness of a rock is dependent upon (1) the hardness of its component minerals and (2) their state of aggregation. However hard the minerals of a rock may be, it appears soft and works readily if the particles adhere with slight tenacity. Many of the softest sandstones are composed of the hard mineral quartz, but the grains fall apart so readily that the stone is as a whole soft. (See under State of Aggregation.)

(2) STRUCTURE.

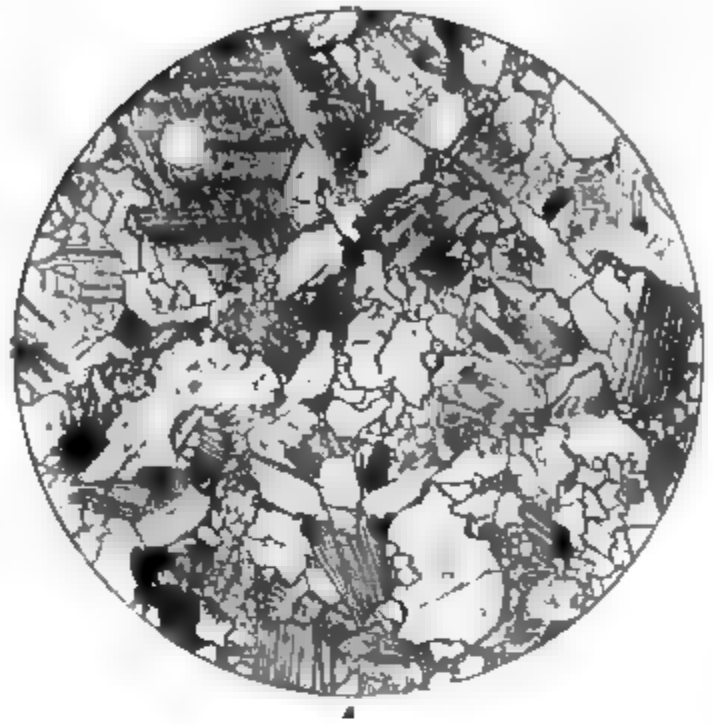
Under this head are considered those characters of rocks which are dependent upon the form, size, and arrangement of their component minerals.

All rocks may be classified sufficiently close for present purposes under one of the three heads (1) crystalline, (2) vitreous or glassy, and (3) fragmental. Of the first, granite and crystalline limestone may be considered as types; of the second, obsidian and pitchstone, and of the third, sandstone. Many structural properties are common to all, others are confined to rocks of a single type. Accordingly as the structure is or is not readily recognizable by the unaided eye, we have:

(1) *Macroscopic structure, or structure which is distinguishable in the hand specimen and without the aid of a microscope.*—Under this head are comprehended structures designated by such names as *granular*, *massive*, *stratified*, *foliated*, *porphyritic*, *concretionary*, etc.; terms whose precise meaning is given in the glossary, and which, with perhaps one or two exceptions, need not be further considered here; and

(2) *Microscopic structures.*—Many rocks are so fine grained and compact that nothing of their mineral nature or structure can be learned from study with the eye alone, and recourse must be had to the micro-

PLATE II.



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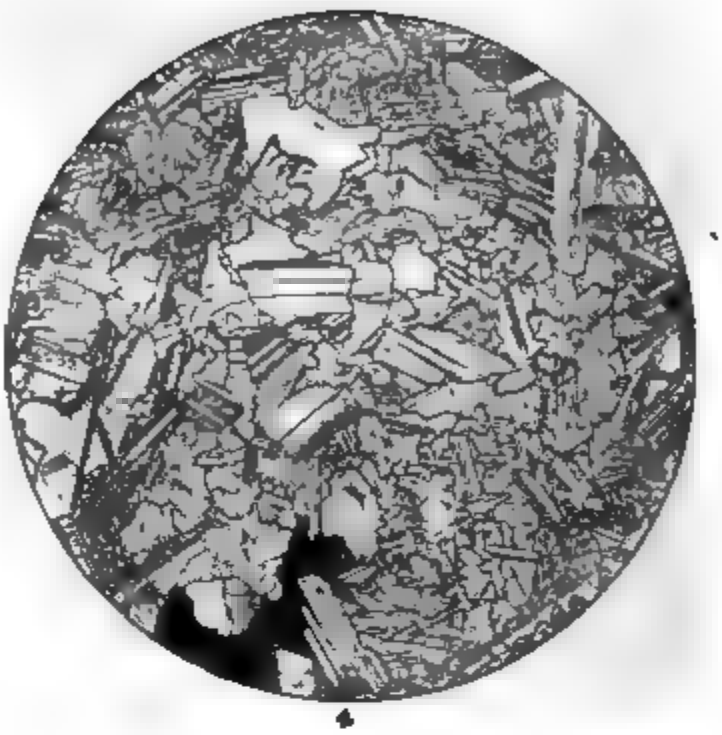

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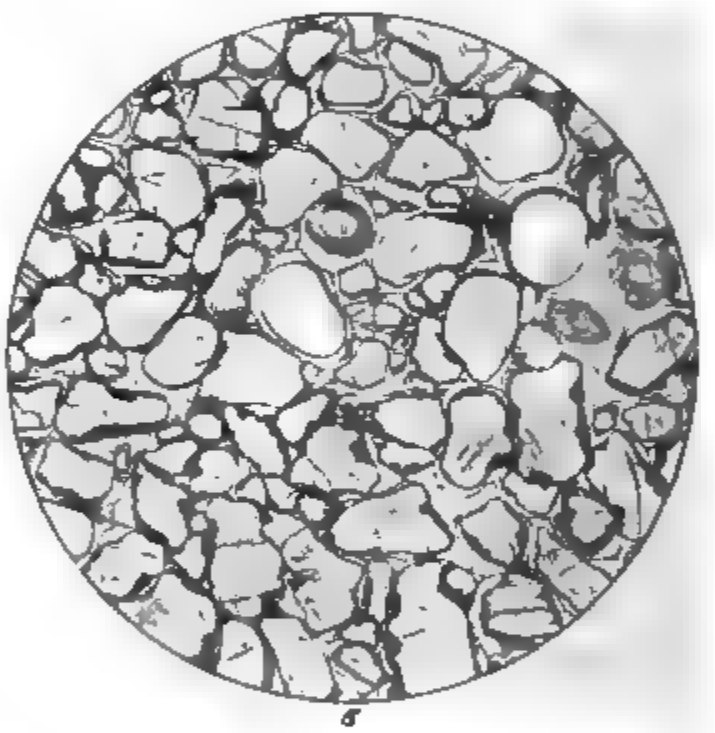

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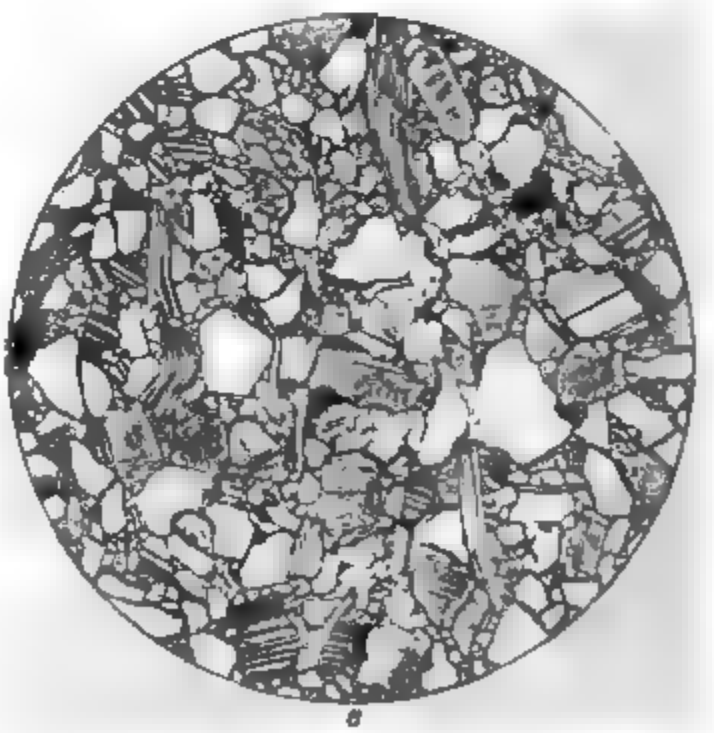


6

SHOWING THE MICROSCOPIC STRUCTURE OF ROCKS.

scope. In such cases it is customary among lithologists to grind a small chip of the rock so thin as to be transparent, and then, when properly mounted in Canada balsam, to submit it to microscopic study. By this method many important points of structure and composition are brought out that would otherwise be unattainable. The physical condition of the minerals of a rock, their freedom from decomposition, and methods of arrangement can often only be ascertained by this method. By it the presence of many minute and perhaps important ingredients is made known whose presence would otherwise be unsuspected. This subject is further treated under the head of Rock-forming minerals and the descriptions of the various kinds of rocks.

In Fig. 1 of Pl. II is shown the structure of the muscovite biotite granite of Hallowell, Me., drawn as are the other figures on this plate from thin sections and under a magnifying power of about twenty-five diameters. This is a granite of quite complex structure, consisting of (1) orthoclase, (2) microcline, (3) plagioclase, (4) quartz, (5) black mica, or biotite, and (6) white mica or muscovite. There are also little needles of apatite, scattering grains of magnetite, and occasionally small garnets present, which, however, do not show in the figure. The quartz, moreover, is pierced in every direction by minute hair-like crystals which are supposed to be rutile. The structure, as in all granites and gneisses, is crystalline throughout, as in the marbles (Fig. 3) and diabase (Fig. 4). The crystals are, however, very imperfect in outline, owing to mutual interference in process of formation. Although the rock contains a very large proportion of the hard minerals quartz and feldspar, these do not interlock so thoroughly as do the augite and feldspars in the diabase. As, moreover, quartz is a brittle substance, these rocks work much more readily and will crush under less pressure than those of which Fig. 4 is a type.

In Fig. 2 of the same plate is shown the structure of an oolitic limestone from Princeton, in Caldwell County, Kentucky. It will be noticed that the first step in the formation of this stone was the deposition of concentric coating of lime about a nucleus which is sometimes nearly round, but more frequently quite angular and irregular. After the concretions were completed there were formed in all cases about each one narrow zones of minute radiating crystals of clear, colorless calcite; then the larger crystals formed in the interstices. An examination of the section in polarized light shows that while the concentric portions are nearly always amorphous the nuclei (and always the interstitial matter) is frequently crystalline. The nuclei are composed in some cases of single fragments or, again, of a group of fragments. Certain of the oolites present no distinct concentric structure, but appear as mere rounded masses merging gradually into the crystalline interstitial portions. On the application of acetic acid to an uncovered slide of this rock a brisk effervescence at once set in, which, when the slide was again placed on the stage of the microscope, was seen not to arise from all

portions of the slide alike, but to be confined almost exclusively to the outer non-crystalline portions of the oolites, so that in time these almost completely disappeared, leaving the crystalline nuclei and cementing material till the very last. Some of the outlines thus left are peculiarly deceptive, having almost the appearance of a cross-section of coral or a crinoid stem. This structure is common, so far as I have observed, to all the oolitic limestones of both Kentucky and Indiana. In the weathering of these stones then we would have produced an effect precisely the opposite of that produced in fragmental siliceous rocks. In the latter case the cement is removed and the grains themselves are but slightly acted upon; in the former, the grains themselves disappear and the cementing material remains.

It should be remarked, however, that we have as yet no proof that the action of an acid atmosphere on one of these oolites would proceed with other than extreme slowness. In fact, their compactness, freedom from cleavage, fractures, and flaws would seem to indicate just the contrary. Further investigations on this point are necessary before one can speak definitely.

The microscopic structure of ordinary white crystalline limestone is shown in Fig. 3, drawn from a magnified section of a West Rutland marble. The entire mass of the rock, it will be observed, is made up of small calcite crystals of quite uniform size closely locked together, and with no appreciable interspaces. The dark stripes across the crystals are caused by twin lamellæ and cleavage lines. All traces of its fossil origin, if such it had, have been obliterated by metamorphism.

Fig. 4 is that of a diabase from Weehawken, N. J. The elongated, nearly colorless crystals, shaded with long parallel lines, are a plagioclase feldspar, the very irregular ones augite, while the perfectly black and opaque are magnetite. The figure is, however, given to show the structure rather than the mineral composition of the rock. It will be noticed that every portion of available space is occupied, there being no residual spaces to be filled by cement, as in the sandstone; also that the feldspars and augites so closely interlock that they can not be forced apart without breaking. As both of these minerals are quite tough and hard, the great strength, durability, and hard-working qualities of the rock can readily be understood, although the constituents themselves are not harder than those that go to make up some of the most friable sandstones.

As showing the differences in structure and composition of the sandstones, Figs. 5 and 6 are given, drawn from thin sections of the brown Triassic stone from Portland, Conn., and a reddish Potsdam stone from quarries in the town of Potsdam, N. Y. In the first mentioned, Fig. 6, the stone, it will be noticed, is com posed of (1) clear, angular grains of quartz, (2) clouded grains of orthoclase and plagioclase, the latter being recognized by its parallel banding, and numerous irregular and contorted shreds of black and white mica. These are all crowded into a

loosely compacted mass and the interstices filled by a cement composed of an amorphous mixture of iron oxides, carbonate of lime, and clayey matter. These are represented in black in the figure. It will be observed that only the quartzes and a few of the feldspars are in a fresh and undecomposed condition, nearly all of the latter being badly kaolinized. The Potsdam stone (Fig. 5) shows, however, a markedly different structure. Here the granules are wholly of quartz, and very much rounded in form. No feldspars, mica, or other minerals are present. The original rounded outline of the quartz granule is shown by the dotted lines and deeply shaded portions, while every portion of the interstices is occupied by a clear, colorless, siliceous cement binding the rock into a hard, compact, and impervious quartzite almost absolutely unaffected by chemical and atmospheric agencies.*

The cause of the wide variation in relative durability of stones of these two types becomes now at once apparent. In the first case the abundant amorphous cement is not only slightly soluble, and liable to partial removal by the water from rains, but it also facilitates the absorption of a proportionally large amount of moisture. On being subjected to repeated freezing and thawing while in this saturated condition, the grains gradually become loosened and the characteristic scaling results. Stones of the Potsdam type, on the other hand, are practically non-absorptive and insoluble, and are susceptible to no other natural influences than the constant expansion and contraction caused by changes in temperature. They are consequently vastly more durable. Unfortunately they are also much harder, and hence can be utilized only at greatly increased expense.

(3) STATE OF AGGREGATION.

This is one of the most important properties of building-stone, since is dependent upon it very largely the hardness or softness of a rock and its consequent working qualities. Many rocks composed of hard

*This rock shows to beautiful advantage the secondary enlargement of quartz granules by deposition of interstitial silica having the same crystallographic orientation as the granules themselves, a peculiarity first noted by the Swedish geologist Tornebohm, later by Sorby (Quar. Jour. Geol. Soc., 1880, p. 58), and since described in great detail in American rocks by Irving and Van Hise, (Am. Jour. of Sci., June, 1883; also Bull. No. 8, U. S. Geol. Survey). I may say further here that the red and brown colors of our Triassic sandstones seem to be due not merely to the thin pellicle of iron oxides with which each granule is surrounded, but the feldspathic grains—often badly decomposed—are stained throughout by the same material, and which also occurs mixed with clayey, calcareous and silicious matter forming the cement. This is never the case, so far as I have observed, in the Potsdam stones, in which the oxide occurs only as a thin coating around each granule, as shown by the shaded portions in Fig 5. My own experience, also, is to the effect that the fragments, of which the Triassic stones are composed, are much less rounded by attrition than seems ordinarily supposed, or as they are represented when figured. Fig. 4 is very typical of the Portland stone, but it does not in the least resemble that given in Fig. 6, Plate XII, Lith. & Min. of New Hampshire. Naturally, however, samples selected from different beds, or from different localities, will be found to vary greatly.

materials work readily because their grains are but loosely coherent, while others of softer materials are quite tough and difficult to work owing to the tenacity with which their particles adhere to one another. Obviously a stone in which the grains adhere closely and strongly one to another will be less absorbent and more durable under pressure than one which is loose textured and friable. A rock is called *flinty* when fine grained and closely compacted like flint; *earthy* when partially decomposed into earth or loam; *friable* when it falls easily into powder or crumbles readily under the tool. Upon the state of aggregation and the fineness of the grain is dependent very largely the kind of fracture possessed by a rock. Fine grained, compact rocks like flint, obsidian, and some limestones, break with concave and convex shell-like surfaces, forming a conchoidal fracture; such stone are called *plucky* by the workmen and they are often quite difficult to dress on this account. Others break with a rough and jagged surface called *hackly* or *splintery*. When as in free-working sandstone and granite the broken surface is quite straight and free from inequalities they are referred to as having a *straight* or *right* fracture.

(4) RIFT AND GRAIN.

The rift of a rock is the direction parallel to its foliation or bedding and along which it can usually be relied upon to split with greatest ease. It is best represented in mica schist, gneiss, and other rocks of sedimentary origin. It is a property, however, common to massive rocks, though usually much less pronounced. The *grain* is always in a direction at right angles with the rift.

These are two most important qualities in any stone that it is desired to work into blocks of any regularity of shape. Without them the production of rough blocks for street paving or for finely finished work would be possible only with greatly increased expense, and only the very softest stones could be worked with any degree of economy. With them the hardest rocks are sometimes most readily worked. Thus the Sioux Falls (Dak.) quartzite, one of the hardest known rocks, is as readily broken out into square blocks for paving as a granite or soft sandstone.

(5) COLOR.

The color of a stone is as a rule dependent more upon its chemical than its physical properties. As will be noted, however, the color of the granites and similar rocks is sometimes varied in shades of light and dark accordingly as the feldspar are clear and glassy and absorb the light or white and opaque and reflect it. The chief coloring matter in rocks is iron, which exists either in chemical combination with the various minerals or in some of its simpler compounds such as the sulphide, carbonate, or oxide disseminated in minute particles throughout the mass of the rock. The oxides of iron impart a brownish or reddish hue, the carbonate or sulphide a bluish or gray. A very light or nearly white

color denotes the absence of iron in any of its forms. On the condition of the iron is dependent also the permanency of color. Either the sulphide, carbonate or other protoxide compounds, are liable to oxidation, and hence stones containing it in these forms fade or turn yellowish and stain on exposure. The sesquioxide on the other hand can undergo no further oxidation, and hence the color caused by it is the most durable. Hence, as a rule, the decidedly red colors may be considered most permanent.

The blue and black colors of marbles and limestones are due largely to carbonaceous matter.

The effects of the various mineral constituents in varying the shades of colors are mentioned in the chapter on rock-forming minerals and in the descriptions of the different kinds of stones. Great care and judgment is needed in the selection of proper colors in building. Heavy rock-faced walls of dull-brown sandstone, dark gneiss, or diabase always impart an appearance of gloom, while warm, bright colors are cheering and pleasing to the eye. The late Architect Richardson, without doubt, owed a considerable share of his success to his power of selecting for any particular piece of work stone of such color as to be most effective and harmonious in the finished structure.

(6) THE CHEMICAL CHARACTERS OF ROCKS.

This naturally varies with the mineral composition and their ever-varying proportions. Nevertheless, it is possible to obtain general averages from which the stones of each particular kind will not be found to vary widely. It is customary to consider rocks which, like granite, are rich in silica as *acidic*, while those in which, as in basalt, the average percentage falls below fifty are called *basic*. Various descriptive adjectives are applied to the names of rocks according as they vary in composition. *Calcareous* rocks consist principally of lime, or contain an appreciable amount; *argillaceous* contain clay, which can usually be recognized by its odor when breathed upon; *siliceous* contain some form of silica; *ferruginous*, iron in the form of oxide; *carbonaceous*, more or less carbon; *bituminous* contain bitumen, which can often be detected by the odor of petroleum given off when the rock is freshly broken. Calcareous rocks can always be detected from their effervescing when treated with a dilute acid. The chemical composition of a stone is often a guide to its suitability for structural purposes. Those containing much lime are more liable to be unfavorably affected by the acid gases of cities, and the various forms of iron present are of importance both regarding the weathering properties of the stones and their colors, as will be noticed later under special cases. A table of rock compositions is to be found near the close of this volume.

D.—ROCK CLASSIFICATION.

The rocks now in use for constructive purposes may be classified sufficiently close for present purposes under the following heads:

A.—CRYSTALLINE AND VITREOUS.

I.—*Simple Rocks.*

1) Silicates:
   (*a*) Talc (including Steatite and Soapstone).
   (*b*) Serpentine. (In part.)
(2) Sulphates:
   (*a*) Gypsum (including Alabaster and Satin Spar).
(3) Carbonates:
   (*a*) Limestone and Dolomites.

II.—*Compound Rocks.*

(1) Massive, with Quartz and Orthoclase; acidic:
   (*a*) Granites and Granite Porphyries.
   (*b*) Quartz Porphyries.
   (*c*) Liparites.
(2) Massive, without Quartz:
   (*a*) Syenite.
   (*b*) Quartz-free Orthoclase Porphyries.
   (*c*) Trachytes and Phonolites.
(3) Plagioclase rocks; basic:
   (*a*) Diorites and Diorite Porphyrites.
   (*b*) Diabases, Gabbros, Melaphyres, and Basalts.
   (*c*) The Andesites:
(4) Rocks without feldspars:
   (*a*) The Peridotites. (Serpentines in part.)
(5) Schistose or foliated rocks:
   (*a*) Gneiss (included here with the Granites).
   (*b*) The Schists.

B.—FRAGMENTAL.

(*a*) The Psammites, including Sandstone, Conglomerate, Breccia, and Graywacke.
(*b*) Pelites including Clayslates and Pipe-clay.
(*c*) Volcanic fragmental rocks, Tuffs.
(*d*) Fragmental rocks of organic origin (included here under the head of Limestones).

The order in which the rocks are mentioned above will be adhered to in the descriptions given in the following pages. For the benefit of those not familiar with the order of succession of the various rock formations in the earth's crust, the following table is also given:

E.—GEOLOGICAL RECORD;

OR

ORDER OF SUCCESSION OF THE ROCKS COMPOSING THE EARTH'S CRUST.

Quaternary, or Post-tertiary.	The age of Man.	Recent, or Terrace.		
		Champlain.		
		Glacial, or Drift.		
Tertiary, or Cenozoic.	Age of Mammals.	Tertiary.	Pliocene.	
			Miocene.	
			Eocene.	
Secondary, or Mesozoic.	Age of Reptiles.	Cretaceous.	Laramie.	
			Upper.	
			Middle.	
			Lower.	
		Jurassic.	Wealden.	
			Upper oolite.	
			Middle oolite.	
			Lower oolite.	
			Upper Lias.	
			Marlstone.	
			Lower Lias.	
		Triassic.	Keuper.	
			Muschelkalk.	
			Bunter Sandstone.	
Primary, or Paleozoic time.	Devonian, or age of Fishes. Carboniferous age.	Permian.	Permian.	
		Carboniferous.	Upper Coal-measures.	
			Lower Coal-measures.	
			Millstone Grit.	
		Subcarboniferous.	Upper.	
			Lower.	
		Catskill.	Catskill.	
		Chemung.	Chemung.	
			Portage.	
		Hamilton.	Genesee.	
			Hamilton.	
			Marcellus.	
		Corniferous.	Corniferous.	
			Schoharie.	
			Cauda-galli.	
	Silurian, age of Invertebrates. Upper Silurian.	Oriskany.	Oriskany.	
		Lower Helderberg.	Lower Helderberg.	
		Salina.	Salina.	
		Niagara.	Niagara.	
			Clinton.	
			Medina.	
	Lower Silurian.	Trenton.	Cincinnati.	
			Utica.	
			Trenton.	
		Canadian.	Chazy.	
			Quebec.	
			Calciferous.	
	Cambrian, or Primordial.	Upper.	Potsdam.	
		Middle.	Georgian.	
		Lower.	St. John's.	
		Archæan, Pre-Cambrian.	Huronian.	
			Laurentian.	

F.—METHODS OF QUARRYING AND DRESSING.

(1) JOINTS IN ROCKS AND THEIR UTILITY IN QUARRYING.

All rocks, whatever their origin, are traversed by one or more systems of natural seams or cracks, called joints. These vary greatly, according to the nature of the rock in which they occur, sometimes being so fine as to be almost imperceptible, or again perfectly distinct and capable of being traced for many yards, or even miles. In stratified rocks (limestones, sandstones, schists, etc.), according to Professor Geikie, the joints, "as a rule," run perpendicular, or approximately so, to the planes of bedding, and descend vertically at not very unequal distances, so that the portions of the rock between them, when seen from a distance, appear like so many wall-like masses. An important feature of these joints, as mentioned by this authority, is the direction in which they intersect each other. In general they have two dominant trends, one coincident on the whole with the direction in which the strata are inclined from the horizon, and the other running transversely at a right angle, or nearly so. The first are called "dip joints" or "end joints" by the quarrymen, since they run with the dip or inclination of the rock, while the last are called "strike joints," since they conform in direction to the strike of the rock. These last are also called "back joints."

In massive rocks like granite and diabase, joints, though prevalent, have not the same regularity of arrangement as in the stratified formations; nevertheless, most rocks of this class are traversed by two intersecting sets, whereby the rock is divided into long, quadrangular, rhomboidal, or even polygonal masses. Frequently, also, there exists a third series of joints running in an approximately horizontal direction, or corresponding more nearly with the bedding in stratified rocks. These are called by quarrymen "bottom joints," since they form the bottom or floor of the quarry. In some instances, as at the Hallowell (Maine) granite quarries, these bottom joints are so pronounced that no artificial means are required to start the rock from its bed after being freed at the sides and ends.

The cause of these joints has never been fully and satisfactorily explained. By some they are supposed to be due to contraction caused by cooling, and by others it is supposed that they are simply fractures produced by earthquakes. Obviously, the matter can not be discussed here, and the reader is referred to the various text-books on geology. But whatever may have been their origin, their presence is a matter of great importance to quarrymen, and, indeed, the art of quarrying has been well stated by Professor Geikie to consist in taking advantage of these natural planes of division. By their aid large quadrangular blocks

can be wedged off which would be shattered if exposed to the risk of blasting.*

(2) GRANITE QUARRYING.

The methods of quarrying naturally vary with the kind and quality of the material to be extracted. In all the object aimed at is to obtain the largest and best shaped blocks with the least outlay of time and money, and this, too, so far as possible, without the aid of explosives of any kind, since the sudden jar thus produced is extremely liable to develop incipient fractures and so shatter as to ruin valuable material.

In quarrying granite there is less to fear from the use of explosives than in either sandstone or marble, while, at the same time, the greater hardness of the stone renders the quarrying of it by other means a matter of considerable difficulty and expense.

In the leading quarries of Maine and Massachusetts no machinery is used other than the steam drill and hoisting apparatus. By means of the drills a lewis† hole or a series of lewis holes is put down at proper intervals to a depth dependent upon the thickness of the sheets. These are then charged, not too heavily, and fired simultaneously. In the Hallowell quarries, where the sheets of granite are entirely free from one another, this is all that is necessary to loosen the blocks from the quarry, and they are then broken up with wedges. In many quarries, however, where the sheets are thicker or the bottom joints less distinct, it is necessary to drill a series of horizontal holes along the line where it is wished to break the rock from the bed and then complete the process with wedges.

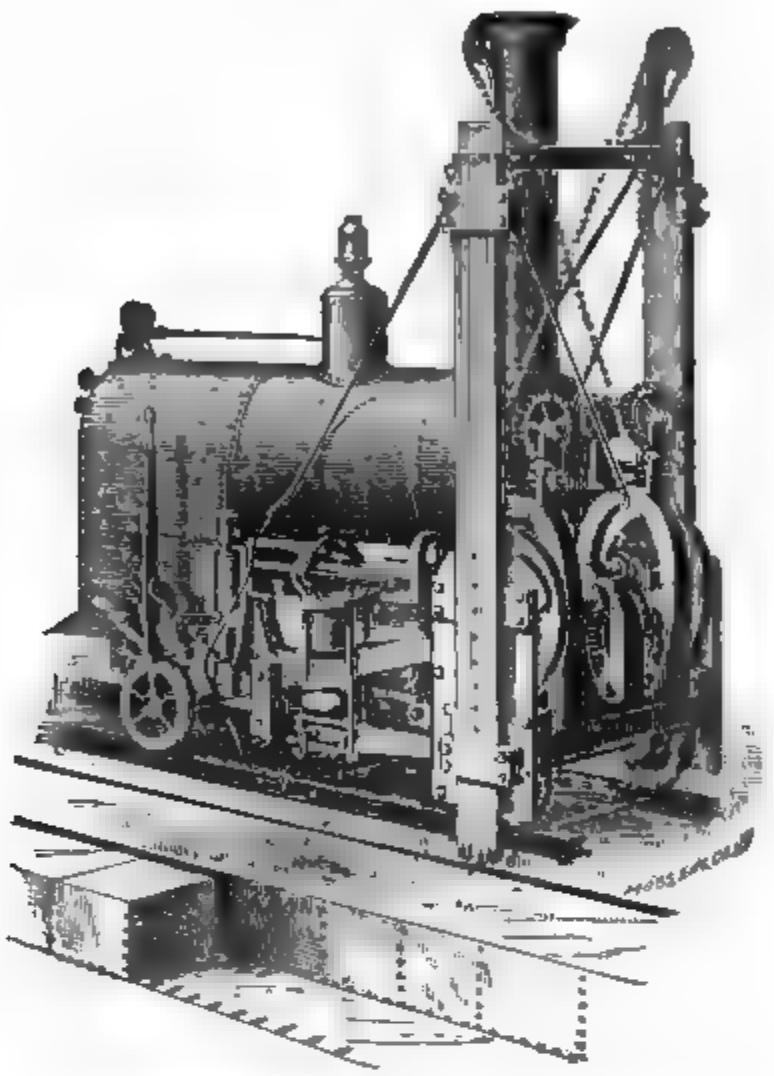
(3) MARBLE QUARRYING.

In quarrying marble and other soft rocks, channeling machines are now largely used. These, as shown in the illustration (page 312), run on narrow tracks, back and forth over the quarry bed, cutting, as they go, vertical channels some 2 inches in width and from 4 to 6 feet in depth. After the channels are completed a series of holes from 8 inches to 2 feet apart are drilled along the bottom of the block, which is then split from its bed by means of wedges. This under drilling is called by quarrymen "gadding," and special machines, which are known as "gadding machines," have been designed for the purpose. (See figures on pages 325 and 326.) At the Vermont marble quarries both the

* A good illustration of the utility of jointed structure as an aid to quarrying sedimentary rocks is offered in the Primordial conglomerates about Boston. These consist of a greenish gray groundmass, in which are embraced a great variety of pebbles of granite, quartzite, melaphyre, and felsite of all shapes and sizes. The beds are traversed by two series of vertical joints which cut the rock and its included pebbles, granite, quartz, melaphyre, and felsite alike, with almost as sharp and clear a cut as could be made by the lapidary's wheel. The joints are very abundant, and in many cases quarrying would be a practical impossibility without them. Whenever smooth walls are required the stone is laid on its bed with the joint face outward.

† I find the word also spelled *louis*. For description see Glossary.

Sullivan diamond-pointed drill and the Ingersoll impact drill are used for gadding. The bottom holes are usually drilled to a depth equaling

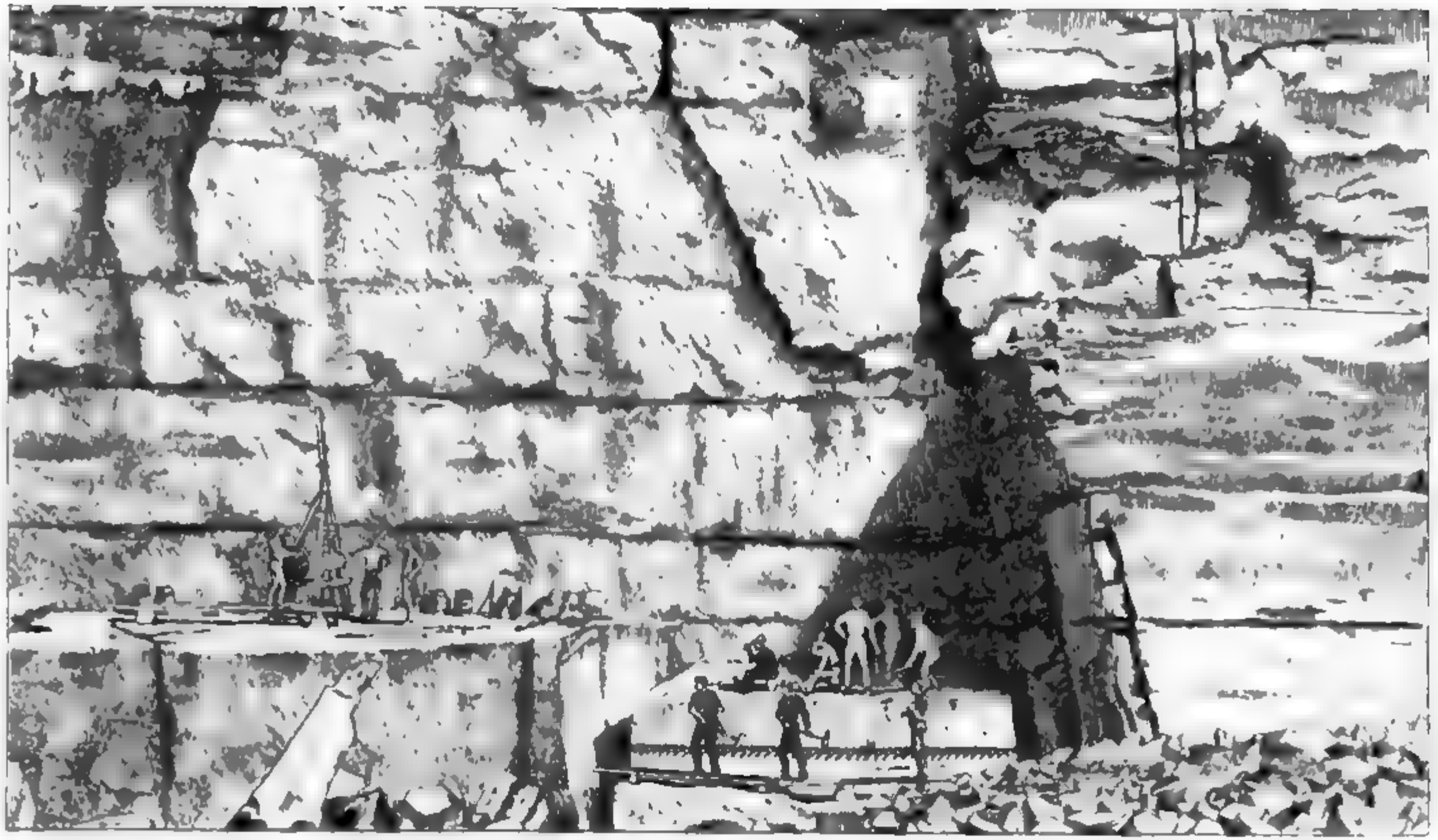


Wardwell channeling machine.

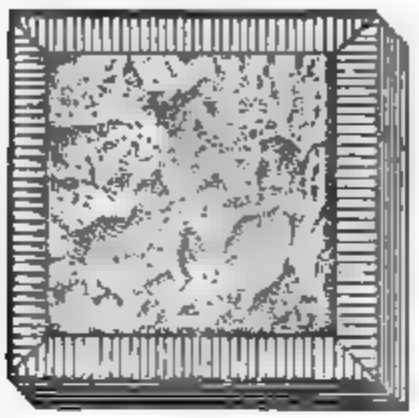
about one-half the width of the block to be extracted, though this depth, as well as the frequency of the holes, must necessarily vary with the character of the rift of the rock.

(4) SANDSTONE QUARRYING.

In the quarrying of the Triassic sandstones at Portland, Conn., the channeling machine is also used to some extent, but the prevailing method of loosening large blocks is by deep drill holes charged with heavy blasts of powder. These holes, which are made by a crude machine driven by cranks, like an ordinary derrick, are 10 inches in diameter and about 20 feet deep. Into these are put from 25 to 75 pounds of powder, contained in a flattened or oval tin cannister, with the edges unsoldered and closed at the ends by paper or cloth. This is placed in the hole in such a position that a plane passing through its edges is in line with the desired break, and fired. In this way large blocks are freed from the quarry, and these are then broken to any required size, as follows: The workmen first cut with a pick a sharp groove some 4 to 8 inches deep along the full length of the line where it is desired the stone shall break. Into this groove are then placed, at intervals of a few inches, large iron wedges, which are then in turn struck repeated



QUARRYING SANDSTONE AT PORTLAND, CONNECTICUT.
Drawn from a photograph.



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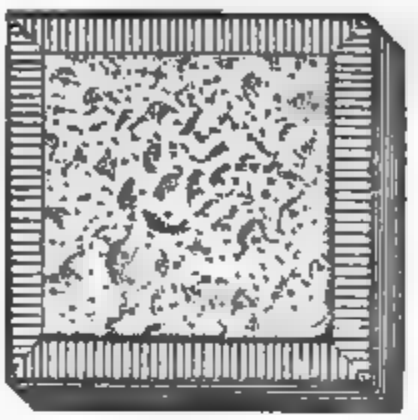

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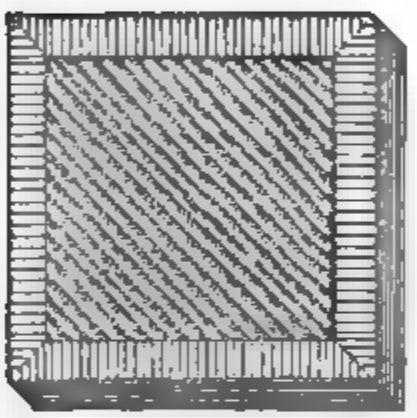

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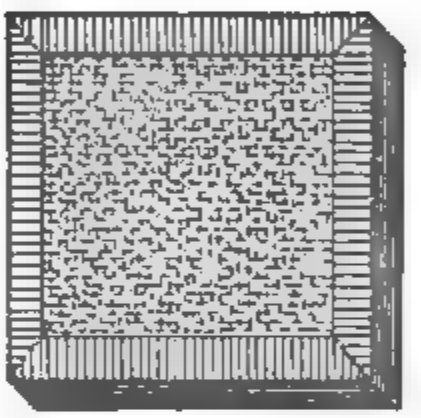

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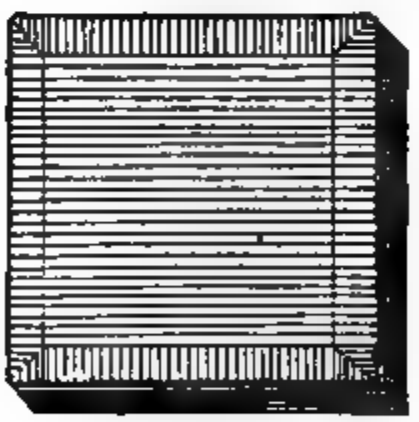

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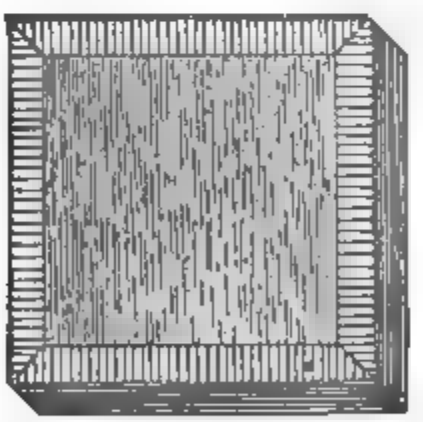


6

KINDS OF FINISH.

FIG. 1. Rock face.
FIGS. 2, 3. Pointed face.
FIG. 4. Tooth-chiseled.
FIG. 5. Square drove.
FIG. 6. Patent hammered.

blows by heavy sledge-hammers in the hands of the quarrymen until the rock falls apart. This process will be made plain by reference to Plate III. In some of the quarries of softer sandstone no machines at all are used, the channeling being done entirely with picks and the stone forced out by means of iron bars alone, or split out with plug and feather. To allow of this, however, the stone must be evenly and thinly bedded, and the different sheets adhere to one another with but slight tenacity, as is the case with certain of the New York "bluestones" and Berea grits of Ohio. In the New York quarries the vertical joints are said to be so numerous as to practically do away with the necessity of channeling.*

Powder is still largely used in most of the smaller quarries, and in all those of granite rock for throwing off large masses. If properly used with these harder varieties, it is doubtful if any serious harm results, but in the quarrying of marble and other soft stones, its use can not be too strongly condemned. As suggested by Sperr† the rapid disintegration of the Carrara marble is no doubt caused in part by the incipient fractures induced through the crude methods of quarrying employed. Excepting when, as in the case of granite, no other means can be employed, explosives of all kinds are to be avoided. When necessary, they should be used in a lewis hole, whereby direction may be given to the force of the discharge and the shock distributed over large surfaces.

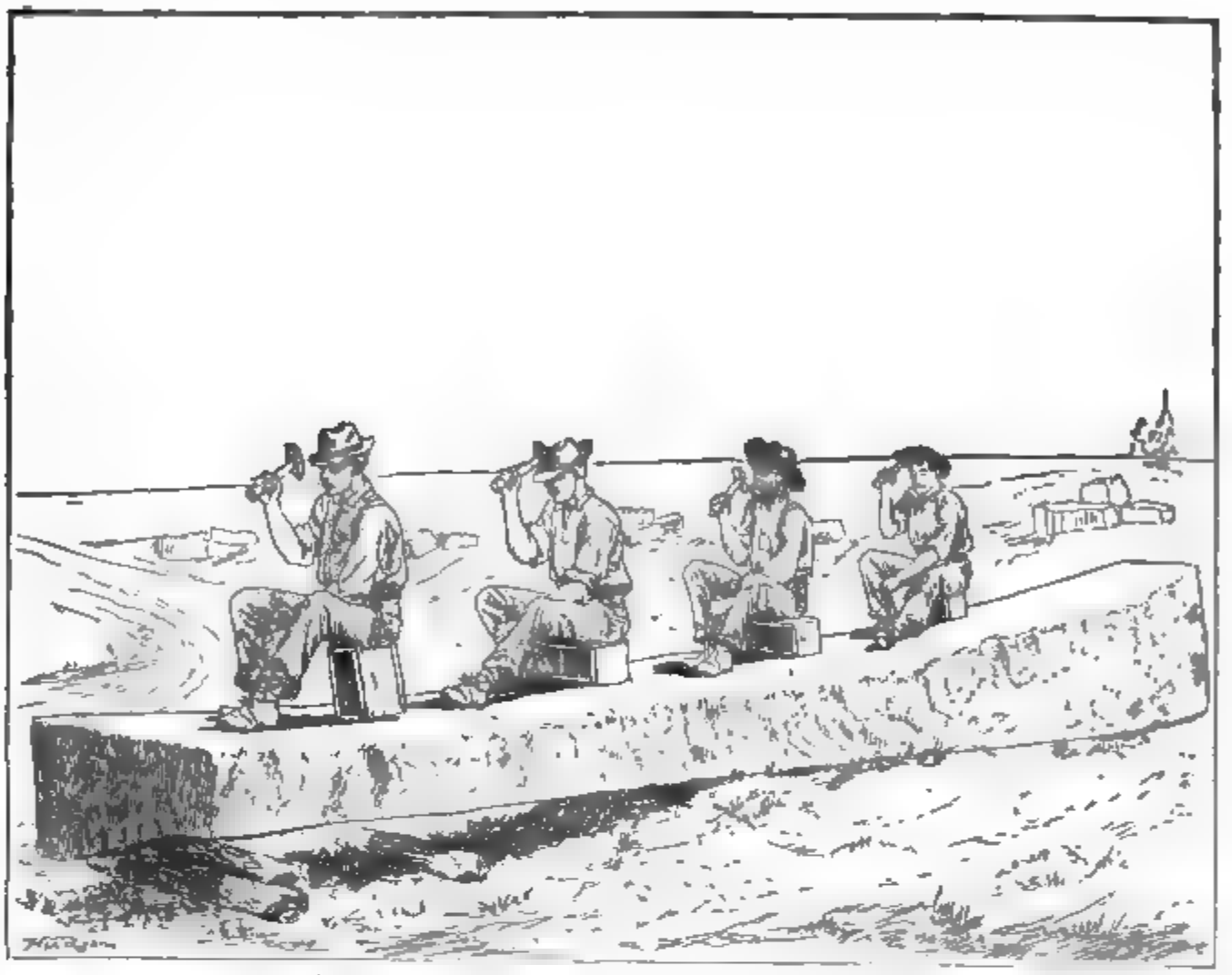
(5) CUTTING AND DRESSING STONE.

In cutting and dressing stone the same slow hand processes that were in vogue hundreds of years ago are still largely employed. There have been, it is true, many machines invented for this purpose, but the majority of them are far from satisfactory in their working qualities, or the cost of running them is so great that they can be used only by the larger and wealthier firms. After a large mass has been split from the quarry bed it is broken into blocks of the required size and shape by means of wedges. A series of holes, three-fourths of an inch in diameter and a few inches deep, is drilled along the line where it is desired the stone shall break, and into each of these two thin half round pieces of soft iron called "feathers" are placed, and a small steel wedge or "plug" placed between. The quarryman then moves along this line striking with his hammer each wedge in its turn till the desired strain is produced and the stone falls apart.

There is a chance for a greater display of skill in this work than may at first appear. Nearly every stone, however compact, has a distinct grain and rift, along which it can be relied on to split with comparative ease and safety. To know the rift and be able to take proper advantage

* F. W. Sperr. Report Tenth Census, p. 37.
† *Op. cit.*, p. 38.

of it is an important item, and it is astonishing how readily an experienced workman will cause a stone to take the desired shape through a knowledge of this property.



Drilling holes for splitting stone with ping and feathers.

This process of splitting stone with wedges is said* to have been first brought into general use in this country by a poor mechanic named Tarbox, of Danvers, Mass. Through the influence of Governor Robbins, who stumbled upon samples of his work by the merest accident, this man was induced in 1798 to go to Quincy and teach his art to the quarrymen of that place. So much did the adoption of this simple method facilitate granite working that the price of the cut material dropped within the space of a few months over 60 per cent. Prior to this time the stone after being blasted from the quarry in irregular blocks was squared down to the proper size by cutting a groove along a straight line with a sharp-edged tool called an axhammer, and then striking with a heavy hammer repeated blows on both sides of the groove until the rock was broken asunder.†

* Proceedings American Academy, Vol. IV, 1859, p. 353.

† In Pattee's History of Old Braintree and Quincy occurs this passage: "On Sunday, 1803, the first experiment in splitting stone with wedges was made by Josiah Bemis, George Stearns, and Michael Wilde. It proved successful, and so elated were these gentlemen on this memorable Sunday that they adjourned to Newcomb's hotel, where they partook of a sumptuous feast. The wedges used in this experiment were flat, and differed somewhat from those now in use."

As to who can justly claim to be the first to bring this method of splitting into

This method is said to have been introduced into Quincy somewhere about 1725–'50, by German emigrants, and, crude as it may seem, was a vast improvement over that used in preparing stone for the construction of King's Chapel, erected in 1749–'54, on the corner of School and Tremont streets, Boston. Here we are told the stone was first heated by building a fire around it and then broken by means of heavy iron balls let fall from a considerable height.

With such difficulties as these to contend with it is not surprising that the building should have been considered a wonder when completed, and that people coming to Boston from a distance made it a point to see and admire this great structure. The wonder, however, was not that the granite could be broken into shape by such methods, but "that stone enough could be found in the vicinity of Boston fit for the hammer to construct such an entire building. But it seemed to be universally conceded that enough more like it could not be found to build such another."

After a block is broken from the quarry bed it is trimmed to the desired size and shape by means of a variety of implements, according to the hardness of the stone and the character of the desired finish.

In dressing granite and other hard stone the tools ordinarily used are the set or pitching chisel, the spalling hammer, pean hammer, bush hammer, hand hammer, chisel, and point. With the set the rough general use the author has no means of ascertaining. That none of the above can justly claim to have *invented* the process is evident from the following:

"I told thee that I had been informed that the grindstones and millstones were split with wooden pegs drove in, but I did not say that those rocks about this house could be split after that manner, but that I could split them, and had been used to split rocks to make steps, door-sills, and large window cases all of stone, and pig-troughs and water-troughs. I have split rocks 17 feet long and built four houses of hewn stone split out of the rocks with my own hands. My method is to bore the rock about 6 inches deep, having drawn a line from one end to the other, in which I bore holes about a foot asunder, more or less, according to the freeness of the rock; if it be 3 or 4 or 5 feet thick, 10, 12, or 16 inches deep. The hole should be an inch and a quarter diameter if the rock be 2 feet thick, but if it be 5 or 6 feet thick the holes should be an inch and three-quarters diameter. There must be provided twice as many iron wedges as holes, and one-half of them must be fully as long as the hole is deep and made round at one end, just fit to drop into the hole, and the other half may be made a little longer, and thicker one way, and blunt pointed. All the holes must have their wedges drove together, one after another, gently, that they may strain all alike. You may hear by their ringing when they strain well. Then with the sharp edge of the sledge strike hard on the rock in the line between every wedge, which will crack the rock; then drive the wedges again. It generally opens in a few minutes after the wedges are drove tight. Then, with an iron bar or long levers, raise them up and lay the two pieces flat and bore and split them in what shape and dimensions you please. If the rock is anything free you may split them as true almost as sawn timber, and by this method you may split almost any rock, for you may add almost any power you please by boring the holes deeper and closer together."

(From letter of John Bartram to Jared Elliot dated January 24, 1757. See Darlington's Mem. of Bartram and Marshall, p. 375.) The precise date at which these four stone houses were built is not stated, but the work above quoted contains an illustration of John Bartram's house, near Darby, Delaware County, Pa. This house,

block is trimmed down to a line. Then the irregular surface is worked down by the point, which is driven by the hand hammer. After pointing, are used the pean and the patent or bush hammers in turn, beginning with the 4-cut and thence working down with the 6-cut, 8-cut, 10-cut, and 12-cut, or until the desired surface is obtained. The condition of the hammered surface at the completion of one of the hammerings should be such that each cut in the hammer traces a line its full length on the stone at each blow.

The single cut or pean hammer should leave no unevenness exceeding one-eighth of an inch, and each finer cut reduces the unevenness left by the preceding.

The 12-cut should leave no irregularities upon the surface of the stone other than the indentations made by the impinging of the plates in the hammer. The lines of the cut are made so as to be vertical in exposed vertical faces when the block is in position. On horizontal and unexposed faces they are cut straight across in any convenient direction. With sawn surfaces of course much of the preliminary work is done away with, as the surface is already sufficiently smooth. It is at present customary to saw only such stone as are designed for polishing or some kind of smooth finish.

In preparing a stone for polishing the surface is first made smooth as possible by sawing or by the means above designated. It is then fur-

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which is of stone, was erected about 1730. Hence we must conclude that the art of splitting stone in this manner was known to some at least as early as this date.

It is stated (Grueber, Die Baumaterialien-Lehre, pp. 60, 61) that in Finland, even at the present day, granite is split from the quarry-bed through the expansive force of ice. A series of holes, from a foot to 15 inches apart and from 2 to 3 feet deep, according to the size of the block to be loosened, is driven along the line of desired rift after the usual custom. These holes are then filled with water and tightly plugged. The operation is put off until late in the season and until the approach of a frost. The water in the holes then freezes, and by its expansion fractures the rock in the direction of the line of holes. Blocks of 400 tons weight are stated to be broken out in this way. A more ancient method consisted in simply plugging the holes with dry wooden wedges and then thoroughly saturating them with water, the swelling wood acting in the same way as the freezing water. Another ancient and well-known method consisted in building a fire around the stone, and when it was thoroughly heated striking it with heavy hammers or throwing cold water upon it. In splitting stone the ancient Romans are said to have sprinkled the hot stone with vinegar, though whether they thereby accelerated the splitting or caused the stone to break along definite lines is not known. Quartz rocks, it is stated, can be made to split in definite directions by wetting them while hot, or laying a wet cord along the line it is desired they shall cleave. The wet line gives rise to a small crack, and the operation is completed by striking heavy blows with wooden mallets. According to M. Raimondi, the ancient Peruvians split up the stone in the quarry by first heating it with burning straw and then throwing cold water upon it. To carve the stone and obtain a bas-relief, this writer contends that the workmen covered with ashes the lines of the designs which they intended to have in relief, and then heated the whole surface. The parts of the stone which were submitted immediately to the action of fire became decomposed to a greater or less depth, while the designs, protected by ashes, remained intact. To complete the work the sculptor had but to carve out the decomposed rock with his copper chisel.

ther reduced by means of wet sand and emery of varying degrees of fineness. Small blocks are now usually ground on a revolving iron bed, on which the abrading material is shoveled and kept wet by a stream of water from overhead. With larger blocks a heavy slab of stone is drawn by the workmen back and forth across the surface on which the wet sand has already been placed. On the finer grades of white marble emery is not used, as it stains; fortunately, owing to the softness of these stones, it is readily dispensed with. After being ground, the surface is rubbed by a sharp, evenly gritted sandstone called a "hone," and then with pumice-stone.

On granites it is often customary to give a "skin coat" by rubbing the block, after the final emerying on the smooth, wet grinding bed, without any abrading material, until a perfectly smooth surface and dull polish is obtained. When this point is reached—and the surface must be quite free from scratches and blemishes, or a good polish is impossible—the polish is produced by means of polishing putty (oxide of tin) rubbed on with wet felt. In cheap work it is customary to use oxalic acid in connection with or entirely in place of the polishing putty. This enables the production of a polish with less labor, but it is also less durable.

A high grade of polish can only be produced by skilled workmen, and each one has his own peculiar methods, varying in trifling particulars from that given above. In many of the larger works where steam power is used, it is said to be customary to mix a quantity of very finely ground metallic lead with the putty. By this means a higher gloss is produced, and also one that is very durable. All the larger works now use machinery in both grinding and polishing. Descriptions of these will be given in the following chapter.

Sundry attempts have been made to utilize the sand-blast process, so extensively used in glasswork, for carving on stone; but so far, with few exceptions, these attempts have met with but poor success. In 1875–'76, Messrs. Sheldon & Slason, of West Rutland, having a large Government contract in preparing head-stones for soldiers' graves in national cemeteries, introduced the system with considerable success. The process consisted in covering those parts of the stone to be left uncut with an iron shield, while letters and figures of chilled iron were placed upon those portions which were to stand out in relief. The blast then being directed against the stone cut away very quickly the unprotected parts. By this means the name, company, regiment, and rank of soldiers, could be cut on a stone in less than five minutes, and two hundred and fifty-four thousand stones thus lettered and having dimensions of 3 feet in length, 10 inches in width, and 4 inches in thickness, were placed in the national cemeteries at a cost of but $864,000. The sand-blast process has also been used with good results on the hard red quartzite of Sioux Falls, as will be noted later.

(6) QUARRYING AND SPLITTING SLATE.

In quarrying slate the methods vary greatly according to the disposition of the beds, and no attempt will be made here at a detailed description. Ordinary blasting powder is employed in loosening the blocks, and great skill and sagacity is shown by experienced quarrymen in so manipulating the blast as to produce the desired effects of freeing the rock from the quarry bed without shattering the stone. After a block is removed from the quarry it is subject to special treatment according to the purpose to which the stone is to be put. If for roofing-slate, the block according to Mr. Sperr* is taken from the quarry to the splitters' shanty, where it is taken in charge by a splitter and his two assistants. The first assistant takes the block and reduces it to pieces about 2 inches in thickness, and of a length and breadth a little greater than those of the slates to be made. This is done by a process called "sculping," which is as follows: A notch is cut in one end of the block with the sculping chisel, and the edge of this notch is trimmed out with a gouge to a smooth groove extending across the end of the block and perpendicular to the upper and lower surfaces; the sculping chisel is then set into this groove and driven with a mallet until a cleft starts, which by careful manipulation is guided directly across the block. The upper surface of the block is kept wet with water so that the crack may be more readily seen. If the slate is perfectly uniform in shape and texture, and the blows upon the sculping chisel are directed straight with the grain, the crack follows the grain in a straight line across the block. Almost invariably, however, the crack deviates to the right or left, when it must be brought back by directing the blow on the sculp in the direction in which it is desired to turn the break, or by striking with a heavy mallet on that side of the block toward which it is desired the crack shall turn. Some slates can be sculped across the grain, but nearly all must be broken in this direction. From the first assistant or "sculper" the block goes to the splitter who by means of a mallet and broad thin chisel splits it through the middle, continuing to thus divide each piece into halves until the desired thinness is obtained. It is necessary to keep the edges of the blocks moist from the time they are removed from the quarry until they are split. From the splitter the thin but irregularly shaped pieces pass to the second assistant who trims them into definite sizes and rectangular shapes. This is done either by hand or by machine. To trim by hand a straight edged strip of iron or steel is fastened horizontally upon one of the upper edges of a rectangular block of wood some 2 to 4 feet in length. The trimmer then lays the sheet of slate upon the block allowing the edge to be trimmed to project over this strip, and then by means of a long heavy knife with a bent handle cuts off the overlying edge, thus reducing it to the required size and shape. Two kinds of

* Report Tenth Census, Vol. x, p. 39.

machines for doing this work are now in use. In general they may be said to consist of an iron frame-work some 2½ feet high, with a horizontal knife-edge upon its upper edge. Against this knife is made to work by means of a treadle another knife, curved in outline, which is thrown upward again by means of a spring, after being brought down by the treadle-movement. At right angles to this knife-edge, on one side of the machine, an iron arm projects toward the workman; this arm has notches cut into it for the different sizes of the slate. The difference between the two kinds of machines is said to consist chiefly in the arrangement of the cutting-knife, one working as stated above, while the other revolves on an axle something in the manner of an ordinary corn cutter.

Slates are sawn by means of an ordinary circular saw, such as is used in sawing lumber, and are planed by machines such as are used in planing metals, as are other soft stone. Some of the hard slates used for tiling have to be cut by means of circular saws with teeth of black diamond.*

(7) KINDS OF FINISH.

The more common kinds of finish applied to stone are described below; the figures on Plate IV being drawn from samples in the national collections.

(1) *Rock face.*—This is the natural face of the rock as broken from the quarry, or but slightly trimmed down by the pitching tool. As in this and all the figures given, it is frequently surrounded by a margin of drove work.

(2) *Pointed face.*—In this finish the natural face of the rock has been trimmed down by means of the sharp-pointed tool called a point. It is used principally for exterior work, as in the walls of a building. Two common styles of pointing are shown.

(3) *Ax-hammered face.*—This finish is produced by striking upon the surface repeated blows with a sharp-faced hammer, called an ax or pean hammer. It closely resembles the next, but is coarser. Used in steps, house trimmings, and other exterior work.

(4) *Patent hammered.*—This finish is produced by striking repeated blows upon the smooth surface of the rock with the rough-faced implement called a patent hammer. Five grades of fineness are commonly recognized, the 4-cut, 6-cut, 8-cut, 10-cut, and 12-cut surfaces, made by hammers composed of four, six, eight, ten, and twelve plates, respectively. A very common finish for the finer kinds of exterior work.

(5) *Bush hammered.*—This finish resembles closely the tooth chiseled or very fine pointing. It is used mostly on soft stone. (See descriptions of bush and patent hammers on p. 329.)

* Detailed and very closely resembling accounts of the methods of working slate are given by F. W. Sperr, in Report Tenth Census, Vol. x, pp. 38–42, and E. Prince, jr., report D 3, Vol. I, pp. 138–143, 2d Geol. Survey, Pennsylvania. To these the reader is respectfully referred.

(6) *Square drove.*—The square-drove surface is made with a wide steel chisel with a smooth edge, called a drove. It is quite common to use this style of finish as a border to the rock-face or pointed surfaces in many kinds of exterior work.

(7) *Tooth chiseled.*—This finish is produced by means of a wide steel chisel with an edge toothed like that of a saw. This and the square drove are used principally upon limestones, marbles, and sandstones, the granites being too hard to be cut in this manner.

(8) *Sawed face.*—This is the surface of the rock as left by the saw; the saw used for the purpose being a thin smooth blade of soft iron fed with sharp sand or chilled iron. This and the following styles, although possessing distinctive characteristics easily recognizable by the eye, are of such a nature that their likenesses can not be well reproduced on paper. Hence no attempt at illustration has been made.

(9) *Fine sand finish.*—To produce this finish the chiseled or sawn surface of the marble is rubbed smooth by means of a block of stone and fine wet sand or on the machines yet to be described.

(10) *Pumice finish.*—This is a very smooth but unpolished surface produced by smooth rubbing with pumice or Scotch hone.

(11) *Polished surface.*—Two kinds of polished surfaces are made—the acid gloss and the putty gloss. For either the surface of the stone is made as smooth as possible by means of sand, or emery, and pumice, or hone, after which it is rubbed with moist woolen cloth and oxalic acid, or polishing putty. The latter produces the best and most lasting gloss, but requires more labor. Frequently the two methods are combined, especially in tombstone work.

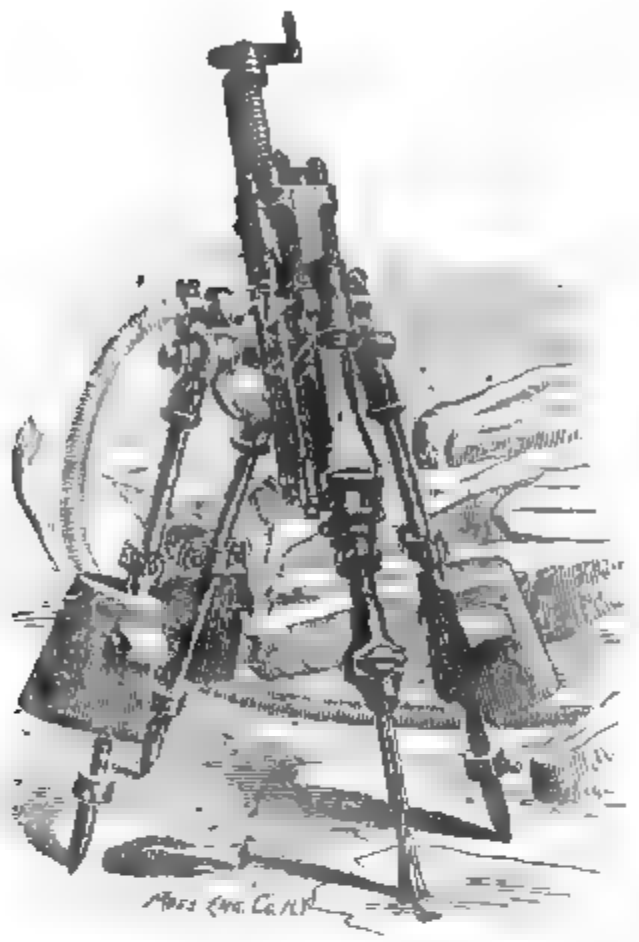
G.—MACHINES AND IMPLEMENTS USED IN STONE WORKING.

DRILLS AND DRILLING MACHINES.

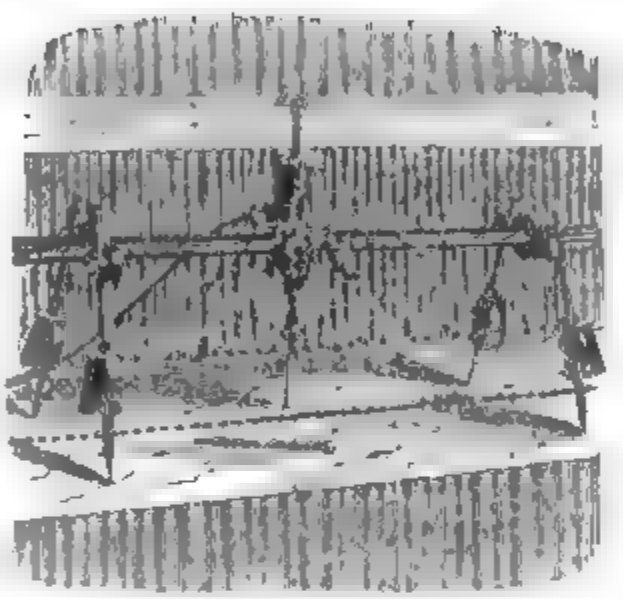
Of the many machines that have from time to time been invented for working stone we can here mention only the principal ones that are to-day in actual use.

Drills.—The old-time method of drilling by means of a flat pointed drill called a "jumper," which is held by one workman while others strike upon it alternate blows with heavy hammers, although still in use in many quarries, has been largely superseded by steam-drills of various kinds. A simple form of the steam-drill, and one now in very general use, is that shown in the accompanying figure (page 321). The drill proper is fastened directly to the piston, which can be inclined at any angle, thus fitting it for ordinary quarrying or for tunneling. It is driven either by steam or by compressed air. A different adaptation of the same principle is employed in the channeling and gadding machines

used in getting out dimension stone. Figures of these are also here given. The drill and cylinder are attached to the horizontal bar by



Eclipse Rock Drill.



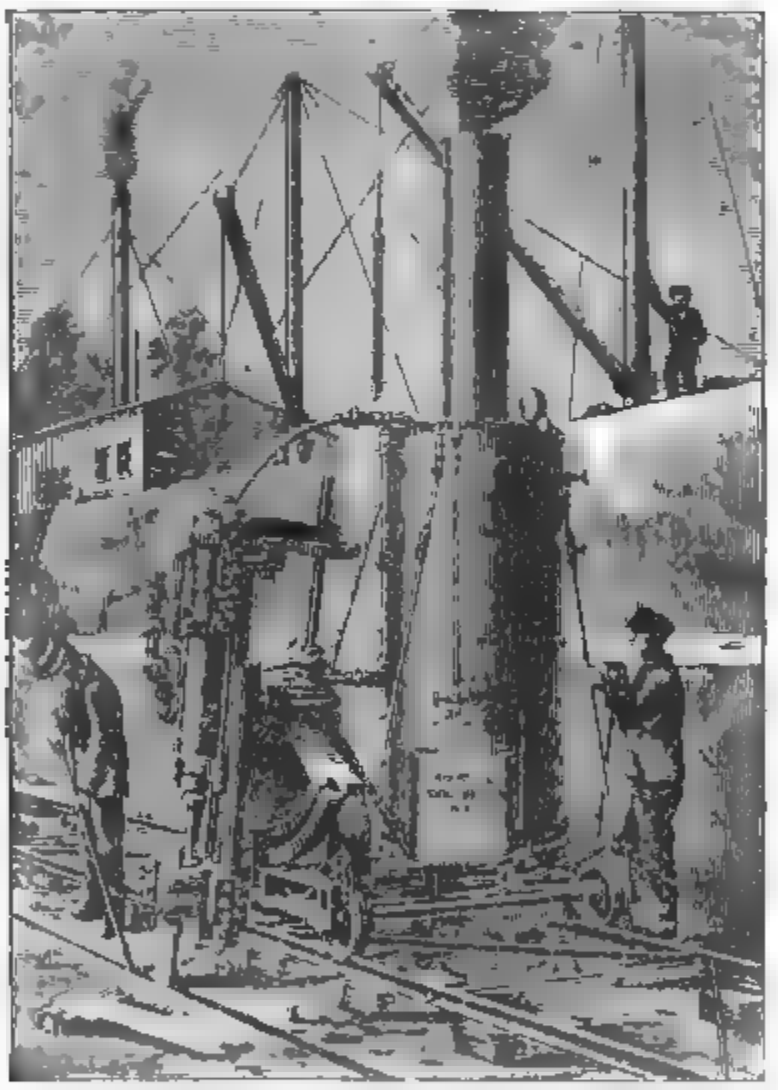
Improved Quarry Bar

means of a clamp, which can be loosened or tightened at will. By this means a dozen or more holes can be cut by simply sliding the drill along the bar and without moving the entire machine.

(2) CHANNELING MACHINES.

The channeling machine shown on page 312 was invented by George J. Wardwell, of Rutland, Vt. The first successful machine was built by him in 1863, in connection with the Sutherland Falls Marble Company, and that original machine has been at work there constantly until within a few months (1885). These machines are now in operation in all the important quarries of sandstone, limestone, and marble in the country, and it is calculated that over 5,000,000 square feet have been cut by them. The channeler is essentially a locomotive machine driven by power, usually steam, moving over a steel rail track which is placed on the quarry bed. It carries a single gang-drill on one side, or two such drills—one on each side. These are raised and dropped by a lever and crank arrangement. The gang of cutters forming the drill is composed of five steel bars, 7 to 14 feet in length, sharpened at the ends and securely clamped together. Of the five cutters, two have diagonal edges; the other three have their edges transverse. The center of the middle largest extends lowest, so that the five form something like a stepped

arrangement, away from the center. The drill, lifted, drops with great force and rapidly creases a channel into the rock. The single-gang machine is operated by two men, the double by three. As it runs backward and forward over the rock the machine is reversed without stopping, and as it goes the cutters deliver their strokes, it is claimed, at the rate of one hundred and fifty per minute. The machine feeds forward on the track half an inch at each stroke, cutting half an inch or more every time of passing. The single machine will cut from 40 to 80 square feet of channel per day in marble or limestone and at a cost of from 5 to 20 cents per square foot. The double machine will do twice the amount of work. A good workman would formerly cut from 5 to 10 feet, that is, a groove 1 foot deep and from 5 to 10 feet long per day.

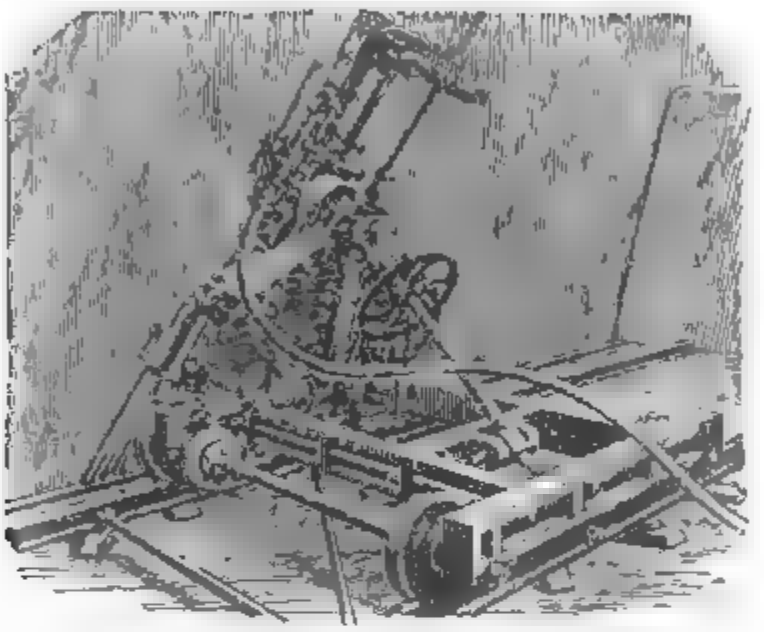


Saunders Channeling Machine with boiler attached.

For this he would receive from 25 to 30 cents per foot.* Another machine for doing the same work as that just described is the Saunders channeling machine shown in the illustration, and which has recently come into use in the Vermont quarries. This differs from the Wardwell in several important particulars, prominent among which are these: (1) The cutting tool is attached rigidly to the piston, so that the blow is dealt directly by the steam pressure in the cylinder and without the intervention of any cranks, levers, or springs. (2) The cutting tools are

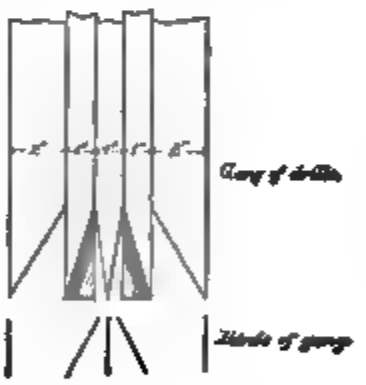
*The Marble Border of Western New England, p. 43.

made adjustable at any angle—to the right, left, forward, or backward. The machine is thus capable of making transverse and sidehill cuts, and does what is known as "cutting out the corners" in quarrying; and (3) it can be used in chambers where the distance between the floor and roof is but 6 feet and can be used in tunnels and headings.



Saunders Channeling Machine making sidehill cuts and with boilers detached.

The machine carries five drills in the gang, with three straight points and two diagonal ones. These are arranged as seen in the accompanying cut:

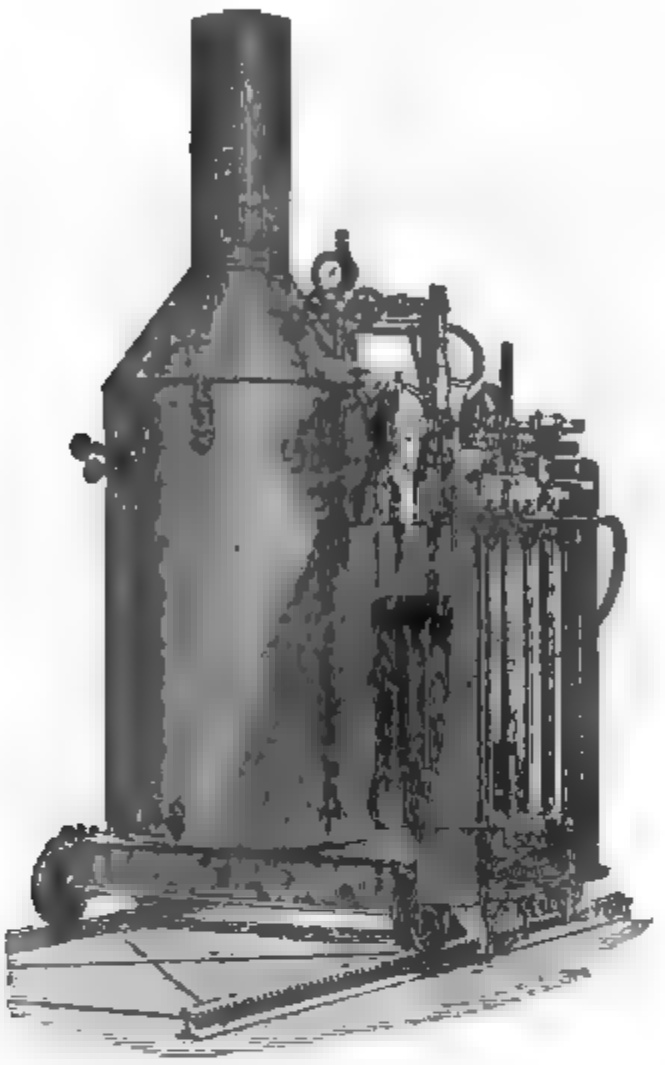


The average capacity of the machine, as claimed by the company's circular, is as follows:

In marble, 80 to 100 square feet of channel in ten hours.
In sandstone, 150 to 200 square feet of channel in ten hours.
In limestone, 120 to 150 square feet of channel in ten hours.

The diamond channeling machine is shown in the figure on page 324. According to the company's circular this machine employs 1¾ inch drill-bits, which are attached to drill-rods of varying lengths, adapted to any required depth of channel up to 9½ feet. The channel may be made open or partly closed, the latter by leaving slight spaces between the holes, to be afterward chipped out. But the whole operation of a clear cut is made simultaneously with the boring by means of an intercutting guide, which answers this purpose very well. The drill can be made to

vary in direction from perpendicular to 50 degrees slant for putting down the tunnel and angle cuts. If necessary the boiler can be left at a distance from the machine, the steam being conveyed by hose.



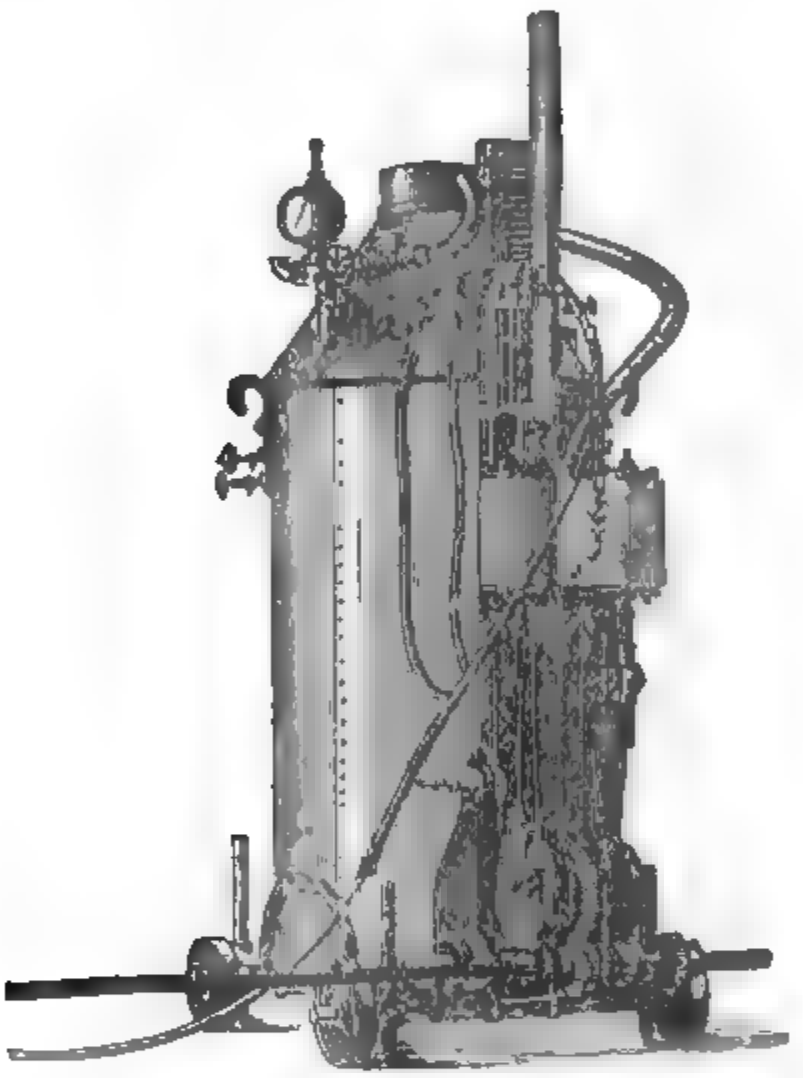
Diamond Channeling Machine.

(3) GADDING AND GADDING MACHINES.

The diamond gadder is shown on page 325. According the company's circular the machine takes its name from the class of work for which it was especially designed and which is known among quarriers as "gadding." When the requisite channel cuts are made about a block of marble to be removed, it is necessary to undercut the block in order to release it. This is usually accomplished by drilling a series of holes beneath it, and then, by wedges, the block is split from its bed.

The machine is placed upon a platform on trucks arranged to run upon a track. When adjusted for work it may be braced by the pointed legs shown. The boring apparatus is attached by a swivel to a perpendicular guide-bar. This guide-bar is secured to the boiler behind it, which forms the main support of the machine. Upon the guide-bar the boring apparatus may be raised or lowered at pleasure, for the purpose of boring a series of holes in a perpendicular line if desired. Upon the swivel the boring apparatus may be turned, so as to bore in any direction within the plane of the swivel-plate.

The illustration shows the drill-rod or spindle placed near the base of the machine, and so as to bore horizontally. At one end of the spindle is the drill-head, armed with carbons, and supplied with small apertures or outlets for water. At the other end of the spindle is attached a hose for supplying water to the drill-head. A rapid revolving movement is communicated to the drill-spindle by the gears shown. The speed and feed movement may be regulated by the operator with reference to the hardness or softness, coarseness or fineness, of the material to be bored; and the feed movement may be instantly reversed at pleasure. The machine is so constructed that the drill-spindle may be re-

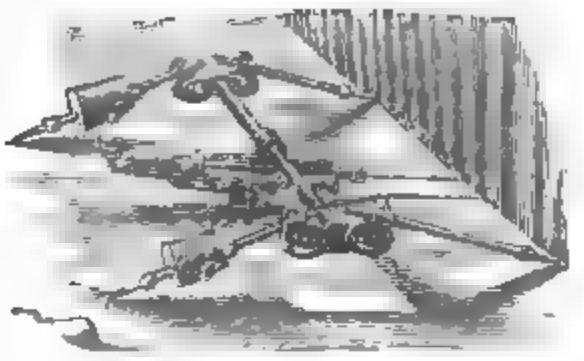


Diamond Gadder.

moved and another inserted in the same holder, adjusted to bore in the opposite direction, the boring apparatus being driven by a double-cylinder engine. A continuation of one of the piston-rods through the cylinder forms the plunger to a small pump placed above the cylinder, which supplies water to the boiler and forces water through the drill spindle and head. These jets of water wash out all the borings made, and keep the drill-head from heating. The usual feed of this drill in marble is from 4 to 5 inches per minute.

Still another style of gadding-machine is used in the Vermont quarries, and which is but an especial adaptation of the eclipse drill shown on page 326. It is claimed that this machine will "put in holes close to the

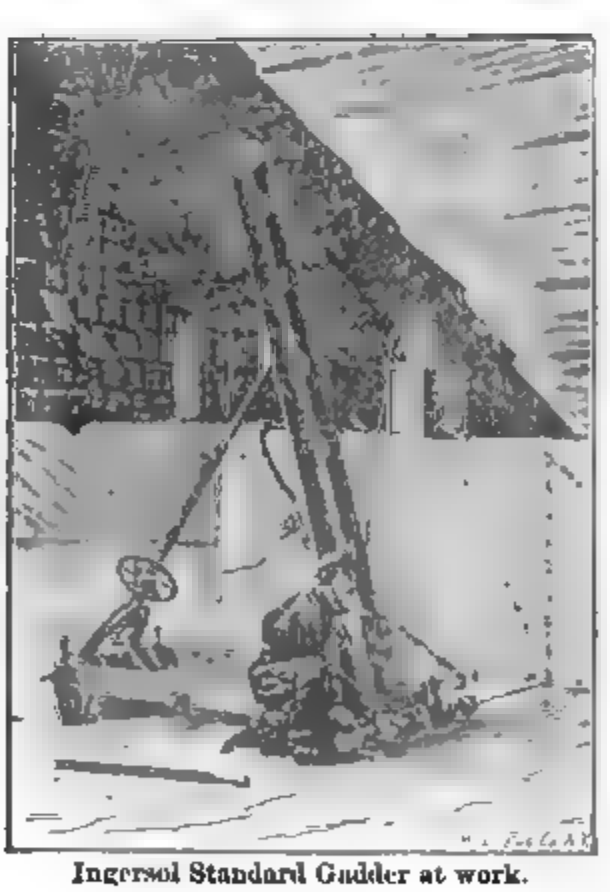
bottom of the quarry, in a horizontal position along the bench, into the roof, or perpendicularly into the floor, as desired."



Plain quarry frame in position for undercutting or gadding.

(4) GRINDING AND POLISHING MACHINES.

In the larger works the grinding and polishing already described is now done by steam power. For flat surfaces a circular, horizontally revolving iron plate or grating, attached to the lower end of a vertical shaft, with elbow joint, is used, the workman guiding it to any portion of the surface he may desire by means of the handle; the abrading substance being sand or emery, as before. With felt attached to the plate the same form of machine is also used for polishing. Blocks of such size as can be handled by the workmen are usually ground upon horizontally-revolving iron beds some 8 or 10 feet in diameter.



Ingersol Standard Gadder at work.

In making straight or only slightly-curved moldings the form is first carved out with the chisel, and then a plate of cast iron, fitted as accurately as possible, is made, by means of a long arm, to travel back and forth over the stone with sand or emery, or putty powder and felt, as the case may be. These are called pendulum machines. The actual labor is thus greatly reduced, and a higher and more lasting polish *obtained* than is possible by the old hand methods.

(5) LATHES AND PLANERS.

For turning posts and pillars lathes are now very generally used for granite as well as for softer stone. In easy working varieties, as sand stone, limestone, or serpentine, the cutting tool is a simple chisel, much like that used in turning metals, and held in a clamp in the same manner. With the harder rocks, like the granite, however, this method is ineffectual, and the cutting tool is in the form of a thin steel disk some 6 or 8 inches in diameter, which is so arranged as to revolve with the stone in the lathe when pressed against it at a sharp angle. By this means large and beautiful columns can be made at far less cost than by the old hand processes.

A monster machine of this character, seen by the writer in the Vinalhaven quarries in 1880, is capable of taking a block 25 feet in length and 5 feet in diameter and turning it down to a perfect column.

With the softer varieties of stone a plain surface, sufficiently smooth for flagging, is produced by means of planing-machines similar to those in use for planing metals. For doing the same work on hard material like granite a planer, with revolving cutting disks of chilled iron, similar to those used in the lathes, has been devised. This machine is shown in the accompanying figure, page 328.

(6) MACHINES FOR SAWING.

In sawing marble and other soft stones the same method, with some modifications, is employed as was in use, according to Professor Seeley,* three hundred years before the Christian era.

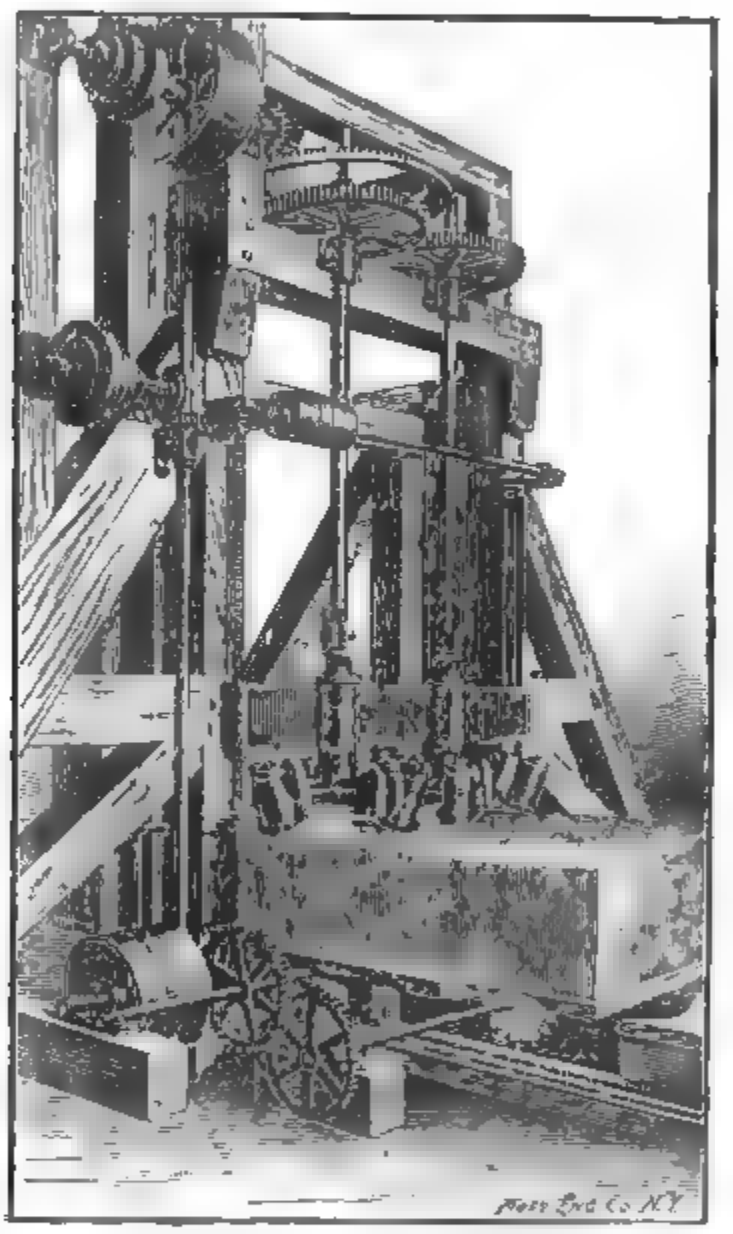
The principle consists simply of a smooth flat blade of soft iron, set in a frame and fed with sharp sand and water. The saws are now frequently set in gangs of a dozen or more in a single frame, and several gangs are tended by one man, who shovels on the wet sand as it is needed, while fine streams of water from overhead wash it beneath the blade as it swings backward and forward in its slowly deepening groove. Some attempts at automatic feeders have been made, but they are not as yet in general use.

This method has been found inapplicable to cutting granite, owing to the greater hardness of the material. Recently a sand composed of globules of chilled iron has been used to good advantage. The great drawback to the use of this material, so far as the author has observed, is the care necessary to avoid staining the stone by rust from the wet globules during the time the machine is not running. This is done by wetting down the stone and globules in the saw frame with a thick solution of lime-water (whitewash) prior to leaving the saws for the night. Circular saws, with diamond teeth, have been used to some ex-

* The Marble Border of Western New England. Proc. Middlebury Hist. Soc., Vol. I, Part II, p. 28.

tent, but have been found too expensive for ordinary work. In sawing slate circular saws are used, such as are employed in sawing lumber. Philo Tomlinson, who was engaged in marble sawing at Marbledale, Conn., near the date 1800, is stated by Professor Seeley* to have been one of the first to successfully apply the gang-saw system in this country.

For sawing circular apertures in the tops of wash-stands or getting out tops for small tables a saw made of plates of soft iron bent into the form of a cylinder and revolved by a vertical shaft is used. Sand emery, or globules of chilled iron form the cutting material, as in the saws just mentioned.



McDonald Stone Cutting Machine.

A recent European invention for sawing stone consists of a twisted cord of steel, made to run around pulleys, like a band-saw. The cord is composed of three steel wires loosely twisted together, but stretched tightly over the pulleys, and is made to run at a high rate of speed. The swift successive blows from the ridges of the cord, delivered along the narrow line, disintegrates the stone much more rapidly, it is claimed, than the iron blades fed with sand, the usual rate of cutting in blocks of

*Op. cit., p. 23.

soft limestone being at the rate of about 24 inches an hour, and in Carrara marble a little more than 9 inches an hour. Brittany granite is cut at the rate of nearly 1¼ inches an hour, and even porphyry can be worked at the rate of eight-tenths of an inch an hour. In certain Belgian marble quarries the saw is said to have been used to advantage in cutting the rock from the quarry bed. In thus utilizing it the floor is first cleared as for channeling machines, and then, by means of large cylindrical drills, fed with metallic sand, a shaft 27 inches in diameter is cut to the desired depth, the cores being removed entire, as in the common tubular diamond drills. Two of these holes are sunk at proper distances apart and guides set up in them, on which move frames carrying pulleys of a diameter somewhat less than that of the holes; over these pulleys the cord-saw is stretched; motion is then imparted to the pulleys by a simple system of transmission, and the saws cut without interruption until the bottom of the drill-pit or shaft is reached.* A great saving of time and material is claimed for this invention, but although it seems to promise well none are at present in use in this country, nor has the author ever had opportunity for examining one.†

(7) THE SAND BLAST.

As already noted, the sand blast has been utilized to some extent in the work of lettering head-stones, and for producing delicate tracings on the Sioux Falls quartzite. That the process is still so little used is due, as I am informed, to the opposition of trades-unions, and not to any deficiency of adaptability in the process itself.

(8) HAND IMPLEMENTS.

Face hammer.—This is a heavy square-faced hammer, weighing from 15 to 25 pounds, and used for roughly shaping the blocks as they come from the quarry. It is sometimes made with both faces alike or again with one face flat and the other drawn out into a cutting edge (Fig. 10, Pl. v). The cavil differs only in having one face drawn out into a pyramidal point.

Ax or pean hammer.—A hammer made with two opposite cutting edges, as seen in Fig. 13, Pl. v. The edges are sometimes toothed roughly, when it is called the toothed ax.

Patent or bush hammer.—A hammer made of four, six, eight, ten, or more thin blades of steel, bolted together so as to form a single piece, the striking faces of which are deeply and sharply grooved. This hammer is said to have been invented by Mr. Joseph Richards, of Quincy, Mass., about 1831–'40. As first constructed the head was composed of a single piece, instead of several, as now (see Fig. 12, Pl. v). In some works this is called the bush hammer.

*Am. Arch. and Build. News, Nov. 7, 1885.

†This apparatus is figured and described in the Scientific American for March 6, 1886, p. 147.

Crandall.—This consists of a bar of malleable iron, about 2 feet in length, and slightly flattened at one end, through which is a slot three-eighths of an inch wide and 3 inches long. Through this slot are passed ten double-headed points of one-fourth inch square steel, 9 inches long, which are held in place by a key.*

The writer has never seen this instrument in use.

Hand hammer.—A smooth-faced hammer, with two striking faces, weighing from 2 to 5 pounds. It is used for hand-drilling, pointing, and chiseling in the harder kinds of rocks (see Fig. 16, Pl. v). The usual form has both faces alike.

Mallet.—This is a wooden implement, with a cylindrical head, used in place of the hammer in cutting the softer stones, as marbles and sandstones (Fig. 15, Pl. v).

Sledge or striking hammer.—A heavy, smooth-faced hammer, weighing from 10 to 25 pounds, used in striking the drills in hand-drilling or in driving large wedges for splitting stone, Fig. 11, Pl. v.

Pick.—An instrument resembling the ordinary pickax used in digging, but somewhat shorter and stouter. It is used on the softer varieties of stones for rough dressing or for channeling prior to wedging.

Pitching chisel.—A steel chisel, the cutting face of which is rectangular in outline and with sharp angles or corners. It is used for trimming down the edges to a straight line. See Fig. 7, Pl. v. The chipper (Fig. 6) is used for very similar purposes.

Chisel or drove.—This is a steel chisel, the cutting edge of which is drawn out wide and thin as shown in Fig. 2, Pl. v. It is used principally on the softer varieties of rock in producing the so-called "drove work."

Splitting chisel.—A steel chisel, made as shown in Fig. 8, Pl. v, and used for splitting and general cutting on hard stone like granite. Other forms of chisels, used only on soft stone and driven with the wooden mallet, are shown in Figs. 3 and 9.

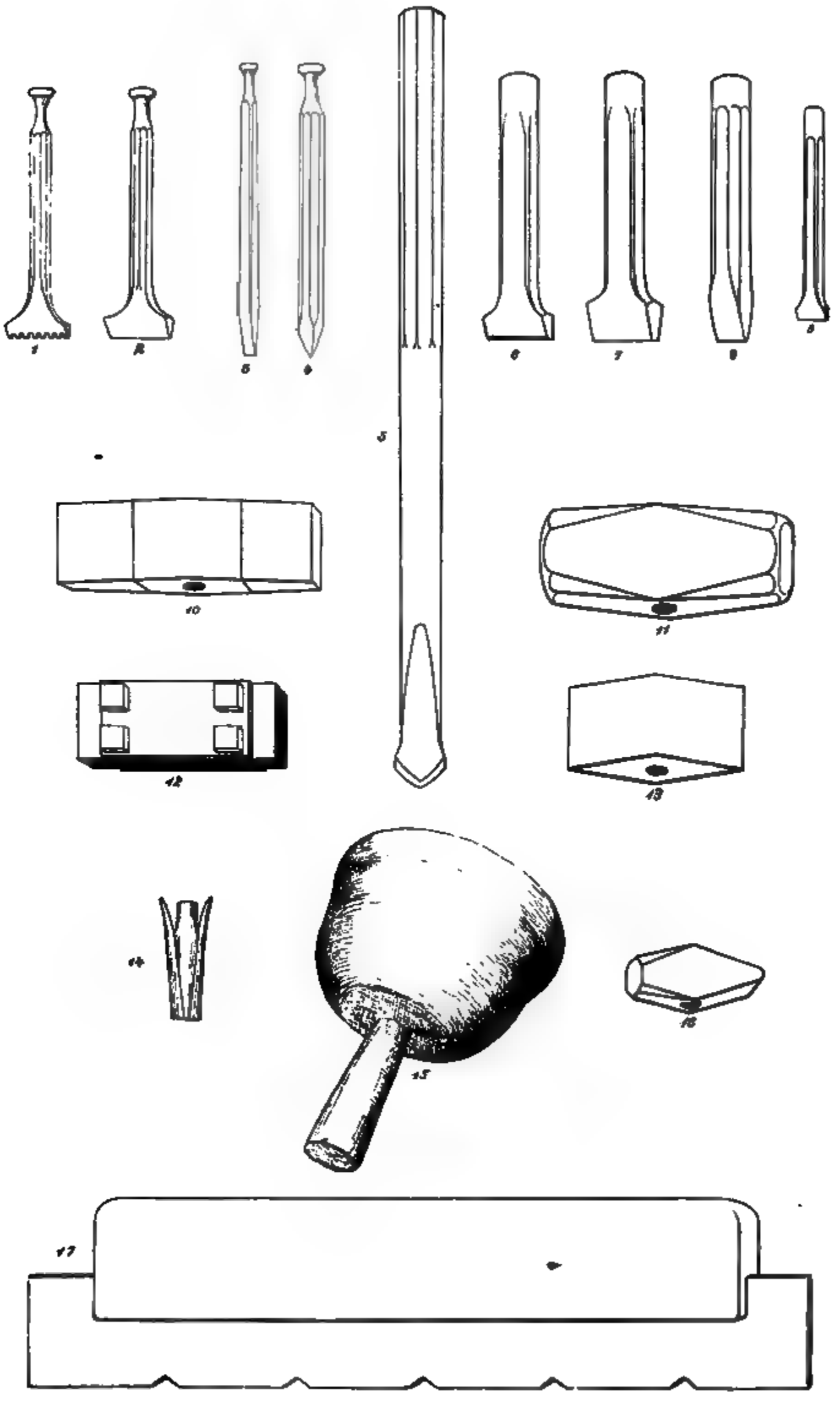
Tooth chisel.—A chisel like the drove chisel, but with the edge toothed like a saw (see Fig. 1, Pl. v), used only on soft stones like marble and sandstones.

Point.—A steel implement, with the cutting end in the form of a pyramidal point (see Fig. 4, Pl. v), used in the production of the finish known as point work and also in the smoothing down of rough surfaces prior to using the ax or some other tool for fine work. Points for use on hard stone and driven by the hammer have the upper end finished as shown in Figs. 6 and 7.

Wedge or plug.—Steel wedges vary greatly in size. Those used in the process of splitting, called plug and feather (Fig. 14, Pl. v), are but two or 3 inches in length, while those used in quarrying for splitting off large blocks are often a foot or more long and correspondingly large.

Hand drill.—A small steel drill from 8 to 15 inches in length, held in

* Man. and Builder, Feb. 1885, p. 38.



TOOLS USED IN STONE-CUTTING.

one hand and driven by the hand-hammer (Fig. 5), used in making holes for "plug and feather" splitting and other light work.

Grub saw.—A saw for cutting stone by hand. It consists of a plate of soft iron from one-twentieth to one-tenth of an inch in thickness and from 6 inches to 4 feet in length; the blade is notched on the lower edge and fitted with a wooden back for convenience in handling and to prevent bending. Sand or emery is the cutting material, as with the steam saws (Fig. 17, Pl. V).

II.—THE WEATHERING OF BUILDING STONES.

The term weathering, as applied to stone, includes the series of physical changes induced by alternations of heat and cold, or by friction, as well as the more complex series of chemical changes, such as may be comprised under the heads of oxidation, deoxidation, hydration, and solution. Since a stone exposed in the walls of a building may be subjected to the influence of any one or the combined influences of several of these agencies, whereby serious consequences, as of discoloration or disintegration may result, it is important to consider, in more or less detail, their comparative energies under varying conditions and upon the various kinds of stone commonly employed for structural purposes.

(1) PHYSICAL AGENCIES.

Heat and cold.—It is safe to say that none of the conditions under which a stone is commonly placed are more trying than those presented by the ordinary changes of temperature in a climate like that of our Northern and Eastern States. Stones, as a rule, possess but a low conducting power and slight elasticity. They are aggregates of minerals, more or less closely cohering, each of which possesses degrees of expansion and contraction of its own. In the crystalline rocks these dissimilar elements are practically in actual contact; in the sandstones they are removed from one another by a slight space occupied wholly or in part by a ferruginous, calcareous or siliceous cement. As temperatures rise, each and every constituent expands more or less, crowding with resistless force against its neighbor; as the temperatures decrease a corresponding contraction takes place. Since with us the temperatures are ever changing, and within a space of even twenty-four hours may vary as much as forty degrees, so within the mass of the stone there is continual movement among its particles. Slight as these movements may be they can but be conducive of one result, a slow and gradual weakening and disintegration.

This constant expansion and contraction is often sufficient in amount to be appreciable in stone structures of considerable size. Thus Bunker Hill Monument, a hollow granite obelisk, 221 feet high by 30 feet square at the base, swings from side to side with the progress of the sun during

a sunny day, so that a pendulum suspended from the center of the top describes an irregular ellipse nearly half an inch in greatest diameter.*

Under such circumstances as these it is not at all strange that many stones show a decided weakening and tendency to disintegration after long exposure, and particularly on those sides of buildings exposed longest to the sun, and which are, therefore, subject to the full range of temperature variations. Professor Julien has called attention to the marked decay thus produced on the western face of the tombstones in Trinity church-yard and elsewhere. It is stated further that the ashlar base of the steeple of the church at Thirty-seventh street and Fifth avenue, New York City, is beginning to exfoliate from this cause on the south side (where the sun shines the longest) but not on the north and east. Other examples are seen on the stone stoops of the east and west streets, where the western face of the dark-brown sandstone is badly disintegrated and exfoliated, while the eastern face remains much longer in a perfect condition. The author has observed similar effects, but in a less marked degree, on the Smithsonian building, at Washington, D. C. The south and west sides frequently show exfoliation, while the north and east, upon which the sun shines but a small portion of the day, are almost untouched.

This same expansion and contraction of stone sometimes produces disastrous effects other than those of disintegration within its own mass.

The difficulty of obtaining permanently tight joints even with the strongest cements led Colonel Totten to institute a series of experiments with a view to ascertain the actual expansion and contraction of granite, sandstone, and marble when subjected to ordinary temperatures. Upwards of thirty experiments on each of these varieties of stone showed the rate of expansion and contraction, which seemed to be uniform throughout the range of temperatures employed, to be for granite .000004825 inch per foot each degree Fahrenheit: for marble .000005668 inch, and for sandstone, .000009532 inch.†

Supposing, then, two coping stones each 5 feet long be laid in midsummer at a temperature of 96° Fahr. In winter the temperature falls to zero, a change of 96°. If the stones contract toward their centers, the whole length of stone put in motion will be 5 feet. In the case of granite, then, the shrinkage amounts to .027792 inch, in marble .03264 inch, and in sandstone to .054914 inch. This shrinkage, small as it seems, from necessity gives rise to cracks at the joints, which admit the passage of water; continual shrinkage and expansion must in time crumble the cement and leave the joint permanently open.‡

The effects of moderate temperatures upon stone of ordinary dryness are, however, slight when compared with the destructive energies of

* Dana, Manual of Geology p. 720.

† Adie found the rate of expansion for granite to be .0000438 inch, and for white marble, .0000613 in.—Trans. Roy. Soc. Edin., XIII. p. 366.

‡ W. H. C. Bartlett on Contraction and Expansion of Building Stone. Am. Jour. Sci., Vol. XII, 1832, p. 136.

freezing temperatures upon stones saturated with moisture. At a temperature of 30° Fahr. the pressure exerted by water passing from a liquid to a solid state amounts to not less than 138 tons to the square foot, or as Professor Geikie has strikingly put it, is equal to the weight of column of ice a mile high. Is it, then, astonishing that a porous sandstone exposed in a house-front to be saturated by a winter's rain and then subjected to temperatures perhaps several degrees below the freezing point shows signs of weakness and exfoliation after a single season's exposure?

Since, then, as every quarryman knows, no stone, however strong, can endure the enormous strain to which it would be subject if frozen solid when holding any considerable amount of water confined within its pores, it is but natural to conclude, as a matter of course, that other things being equal those stones are most durable which will absorb and retain the least moisture.*

This rule is not to be accepted, however, without a considerable grain of allowance, since a coarsely porous stone, though capable of taking up a large amount of moisture will also part with it readily, or if frozen while saturated will permit a considerable proportion of the expansive force of the solidifying water to be expended otherwise than in pushing apart the grains composing it. Otherwise expressed, the water will freeze out of a coarsely porous stone, while in one that is compact it may create sad havoc. This is well illustrated by the common occurrence of water freezing in straight cylindrical or widely-expanding vessels, and in narrow-necked pitchers and bottles. In the first instance the open space above is sufficient to allow all the expansion to take place vertically. The narrow-necked vessel, on the other hand, is almost invariably broken.

To ascertain, then, the porosity or ratio of absorption of any stone is an important test.†

Obviously the best method of ascertaining the power of a stone to withstand the effects of frost is to actually expose prepared blocks to such a temperature, when saturated with water, as to freeze them solid and then note the amount of disintegration, or loss in strength. Un-

* "Other things being equal, it may probably be said that the value of a stone for building purposes is inversely as its porosity or absorbing power." (Hunt, Chem. and Geol. Essays, p. 164.)

† Hunt in a series of tests obtained results as follows:

Potsdam sandstone, Canada, absorbed from 0.50 to 3.26 per cent. in twenty-four hours.

Medina sandstone, Canada, absorbed from 3.31 to 4.04 per cent. in twenty-four hours.

Sub-Carboniferous sandstone, Ohio, absorbed from 9.59 to 10.22 per cent. in twenty-four hours.

Lower Silurian limestones and dolomites, Canada, absorbed from 0.11 to 5.55 per cent. in twenty-four hours.

Tertiary limestones, Caen, France, absorbed from 15 to 16.05 per cent. in twenty-four hours.

fortunately this can not at all times of the year and in all places be done, and artificial methods must be resorted to. Brard's process, as modified by M. Héricart and Thury, consisted in boiling the cube to be experimented upon for half an hour in a saturated solution of sulphate of soda (Glauber salt) and then allowing it to dry, when the salt taken into the pores crystallized and expanded in a manner supposedly somewhat similar to that of water when freezing.*

This process is not now in general use, as experiment has shown that the salt exercised a chemical as well as mechanical action, and produces results somewhat at variance with that of freezing water. The most important series of experiments ever performed with the process in this country were those of Mr. C. G. Page, made with reference to the selection of material for the Smithsonian Institution Building at Washington.

The results are given in the following table.†

Materials.	Specific gravity.	Loss in grains.
Marble, close-grained, Maryland	2.834	0.19
Marble, coarse "alum stone," Baltimore County, Md	2.857	0.50
Marble, blue, Maryland	2.613	0.34
Sandstone coarse, Portland, Conn	.....	14.36
Sandstone, fine, Portland, Conn	2.583	24.03
Sandstone, red, Seneca Creek, Md	2.672	0.70
Sandstone, dove-colored, Seneca Creek, Md	2.486	1.78
Sandstone, Little Falls, N. J	.....	1.58
Sandstone, Little Falls, N. J	2.482	0.62
Sandstone, coarse, Nova Scotia	2.518	2.16
Sandstone, dark, coarse, Seneca Aqueduct, Peters's quarry	.....	5.60
Sandstone, Acquia Creek, Va	2.230	18.60
Sandstone, 4 miles above Peters's quarry, Md	.....	1.58
Sandstone, Beaver Dam quarry, Md	.....	1.72
Granite, Port Deposit, Md	2.609	5.05
Marble, close-grained, Montgomery County, Pa	2.727	0.35
Limestone, blue, Montgomery County, Pa	2.699	0.28
Granite, Great Falls of the Potomac	.....	0.35
Soft brick	2.211	16.46
Hard brick	2.294	1.07
Marble, coarse dolomite, Mount Pleasant, N. Y	2.860	0.91

The specimens operated upon, it should be stated, were cut in the form of inch cubes. Each was immersed for half an hour in the boiling solution of sulphate of soda, and then hung up to dry, this performance being repeated daily throughout the four weeks which the experiment lasted.

The injurious effects of artificial heat, such as is produced by a burning building, are, of course, greater in proportion as the temperature is higher. Unfortunately sufficient and reliable data are not at hand for estimating accurately the comparative enduring powers of various stones under these trying circumstances. It seems, however, to be well proven that of all stones granite is the least fire-proof, while the fact that certain of the fine-grained siliceous sandstones are used for furnace

*Chateau, Technologie Du Batiment, Vol. 1, p. 262.

†From Hints on Public Architecture by Robert Dale Owen, p. 119.

backings would seem to show that if not absolutely fire-proof, they are very nearly so.*

It must be remembered, however, that the sudden cooling of the surface of a heated stone, caused by repeated dashes of cold water, has often more to do with its disintegration than heat alone.

Effects of friction.—The amount of actual wear to which stones in the walls of a building are subjected is naturally but slight in comparison with those in the sills, steps, and walks, which are subject to the friction of feet and other agencies. Nevertheless it is sufficient in many cases to become appreciable after the lapse of several years. The striking effect produced by wind-blown sands in the Western States and Territories has often been alluded to† and even in the Eastern States, as at Cape Cod, Massachusetts, there may frequently be seen window-panes so abraded by blowing sand as to be no longer transparent.‡

This same abrading process is going on in all city streets, where the wind blows dust and sand sharply against the faces of the buildings; not with sufficient force, it may be, to perceptibly wear away the fresh stone, but yet forcibly enough to crumble away the small particles already loosened by atmospheric decomposition and thus expose new surfaces to be acted upon. Professor Egleston§ states that in many of the church-yards of New York City the effects of this abrasive action can be seen where the stones face in the direction of the prevailing winds. In such cases the stones are sometimes worn very nearly smooth and are quite illegible from this cause alone.

Effects of growing organisms.—It is in such exposed situations, as above mentioned, that a stone is often protected from serious loss by a coating of lichens or mosses, which by growing over its surface shield it from the abrasive action. The full effect of growing organisms upon the surface of stones is still, however, a matter of dispute. By some authorities‖ it is thought that they give rise to small amounts of organic acids which exercise a corrosive influence. By others they are considered as beneficial, since they protect the stone from the sun's rays and the rain and wind. It seems probable that they may exert either a harmful or beneficial action according to the kind of stone on which

* Cutting's experiments (Weekly Underwriter) showed that up to the point at which they are converted into quicklime (that of bright redness), limestones are less injured by heat than either granite or sandstones, a result not fully borne out by the experiments of Winchell (Geol. of Minn., Vol. I, p. 197–201).

† On the Grooving and Polishing of Hard Rocks and Minerals by Dry Sand. W. P. Blake. Proc. A. A. A. S., Providence meeting.

‡ There is on exhibition in the National Museum a plate of glass formerly a window in the light-house at Nauset Beach, Massachusetts, that was so abraded by wind-blown sand during a storm of not above forty-eight hours' duration as to be no longer serviceable. The grinding is as complete over the entire surface as though done by artificial means.

§ Am. Arch., September 5, 1885, p. 13.

‖ See Winchell, Geol. of Minn., Vol. I, p. 188.

they grow and its environment. More observations are necessary before anything definite can be said.*

(2) CHEMICAL AGENCIES.

Composition of the atmosphere.—The atmosphere in its normal state consists of a mechanical admixture of nitrogen and oxygen in about the proportions of four volumes of the former to one of the latter, together with minute quantities of carbonic acid, ammonia, and vapor of water. In the vicinity of large manufacturing cities, however, it carries in addition to increased proportions of carbonic acid,† appreciable quantities of sulphurous, sulphuric, nitric, and hydrochloric acids. These, when brought by rains into contact with the walls of buildings, are capable, throughout many years of time, of producing marked effects, especially when aided by the extreme diurnal ranges of temperature common in the eastern and northern United States.‡

* The vegetation of microscopic lichens takes place upon the surface of the stone, when, from any cause, that surface becomes roughened so as to afford a lodgment for the seeds or spores of these plants. These growing, still further hasten the disintegration of the stone, and accumulating about them the fine dust floated by the atmosphere becomes points for the absorption of more water, which, on freezing, still further roughens the surface, and the patch of lichen gradually extends. These lichens often gain attachment upon the surface of a finely dressed stone, from some little inequality of texture, or from softer material that more readily becomes decomposed or more readily accommodates the growth of the plant. Such stones in time become partially or entirely covered by lichens, and present an unsightly aspect. The amount and degree of this growth varies with position in reference to the sun and with a more or less elevated situation.

It should not be forgotten, however, that any stone giving root to lichens is not one of those which most easily disintegrates, for in these the destruction goes on so rapidly that the surface does not allow the growth of such plants. The lichen-covered rocks in nature are usually those of great strength and durability. None of the softer or rapidly decaying rocks produce this vegetation. (Rep. on Building Stones by James Hall, 1868, pp. 54 and 55.)

† Twenty-one tests of the air in various parts of Boston during the spring of 1870 yielded Mr. Pearson 385 parts of carbonic acid in 1,000,000. Eleven tests of the winter air of Cambridge yielded Mr. Hill 337 parts of the acid in 1,000,000 (Second Annual Report Massachusetts State Board of Health, 1871, p. 52). Dr. Kidder found the outdoor air of Washington to contain from 387 to 448 parts in 1,000,000. Mr. Angus Smith (Air and Rain, p. 52), after an elaborate series of experiments, reports the air of Manchester (England) to contain on an average 442 parts of the acid in 1,000,000.

‡ Dr. Smith (*op. cit.*) found the proportions of these acids in London, Liverpool, and Manchester to be as follows:

Localities.	Sulphuric.		Hydrochloric.		Nitric.	
	Grains per gallon.	Parts per million.	Grains per gallon.	Parts per million.	Grains per gallon.	Parts per million.
London	1.4345	20.49	.0872	1.250	.....	.840
Liverpool	2.7714	39.59	.7110	10.16	.....	.582
Manchester	2.9163	41.66	.4055	5.79	.....	.886

He also found the *total* acids for Manchester to average for 1870 3.7648 grains per gallon. It should be noted, however, that these acids were not considered as existing

Chemical action of the atmosphere.—The series of changes induced by these agencies are, as above indicated, chemical in their nature and may all, as first suggested be conveniently grouped under the heads of oxidation, deoxidation, hydration, and solution. These may as well be considered in the order given.

Oxidation.—The process of oxidation is commonly confined to those stones which carry some form of iron as one of their constituent parts. If the iron exists as a sulphide (pyrite or marcasite), it very probably combines with the oxygen of the air on exposure, forming the various oxides of iron such as are popularly known as "rust." If the sulphide occurs scattered in small particles throughout a sandstone the oxide is disseminated more evenly through the mass of the rock, and aside from a slight yellowing or mellowing of the color, as in certain of the Ohio sandstones, it does no harm. Indeed, as suggested by Professor Winchell,* it may result in positive good, by supplying a cement to the individual grains, and thus increasing the tenacity of the stone. In all other than sandstones, however, the presence of a readily oxidizable sulphide is a serious defect, since crystalline rocks require no such cement, and the change in color can in very few cases be considered other than a blemish. This is well illustrated in some of the lower courses of granite in the new capitol building at Albany, New York, to which reference has already been made. More than this, the pyrite, in decomposing in contact with the gaseous atmosphere of cities, may give rise to small quantities of sulphurous and sulphuric acids, which by their corrosive action upon the various mineral constituents of the stone render it porous and more liable to the destructive effects of frost. (See p. 301.) The conversion by oxidation of a sulphide into a sulphate is moreover attended with an increase in volume; there is thus brought to bear a mechanical agency to aid in the work of disintegration.

Iron in the form of a ferrous carbonate is a common constituent of many calcareous rocks, and in the form of other readily decomposable protoxide compounds occurs not infrequently in the cementing material of fragmental rocks lying below the water level. All these compounds are susceptible to oxidation on exposure to atmospheric influences, and to these, more than to the presence of sulphides is presumably due the mellowing commonly observed in white marble or the light gray sub-Carboniferous sandstones.

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in the atmosphere entirely in an uncombined state, but were probably in large part combined with other substances to form chlorides, sulphates, etc. L. P. Gratacap (School of Mines Quarterly, May, 1885, p. 335), from a series of tests at Staten Island, New York, computed the entire amount of chlorine brought down by the rains during 1884 to have been some 46.23 pounds for each acre of ground. This is regarded as in large part combined with sodium to form sodium chloride (common salt). Egleston (Cause and Decay of Building Stone, p. 5) estimates that the 4,500,000 tons of coal annually burnt in New York City discharge into the air 78,750 tons of sulphuric acid. In 65 cubic centimeters of rain-water caught during an exposure of forty-one days, this same authority found 4¼ milligrams of sulphuric acid.

* Geol. of Minn., Vol. I, p. 189.

Iron, in the form of magnetite—a mixture of the ferrous and ferric oxides—is liable to still further oxidation, becoming converted wholly into the hydrous or anhydrous ferric oxide. Thus, if abundant, the rock assumes a rusty hue, and perhaps gradually falls away to a coarse sand, as is the case with certain of our diabases.*

Black mica, hornblende, augite, and other silicate minerals rich in iron are also liable on long exposure to change through the further oxidation of this ingredient, but when a stone is placed high and dry, as in the walls of a building, this change must necessarily be so slow as to be of little moment, though of the greatest importance from a geological standpoint. Mr. Wolff, however, states† that tombstones of diabase in cemeteries about Boston have in some cases turned a rust-brown color, the change apparently occurring in the hornblende and augite. The feldspars of the granites used in this same city were also observed in many cases to have become liver-brown, rusty-red, or yellow owing to the higher oxidation of the iron contained by them.

Deoxidation.—The process of deoxidation, whereby a ferric is changed to a ferrous oxide, is possible generally only in presence of organic acids and continual moisture. It is likely, therefore, to affect only those stones used for foundations, and need not be further considered here. The same may be said in regard to hydration, whereby an anhydrous is changed to a hydrous oxide. The blotching and variegation of beds of sandstone, as those of Marquette, Mich., is due to the deoxidation and hydration of the iron oxides forming their cement, together with a partial removal of the same by the aid of organic acids. Such changes are presumably possible only in the quarry bed or in moist foundations and bridge abutments.

Solution.—The subject of solution can not, however, be passed over so lightly. Pure water alone is practically without effect on all stones used for building purposes. Rain-water, however, as already noted, may contain appreciable quantities of various acids which greatly add to its solvent power, as the rapid destruction of certain classes of rocks only too well attests. Carbonate of lime, the material of ordinary marbles and limestones, is particularly susceptible to the solvent action of these acids even when they are present in extremely minute quantities, and to this agent is largely due the rapid defacement of the marble tombstones in church-yards and the marble-faced buildings in cities.

It is to the ready solubility of calcium carbonate that is due in large part the poor weathering qualities of sandstones with calcareous cements. The calcite is slowly removed by solution; the silicious grains thus become loosened, and, falling away under the influence of wind and rain,

* In one part of the dikes that form the Hanging Hills at Meriden, Conn., the rock (diabase) is quite black, and the amount of iron (nearly 14 per cent. of magnetite) has been the cause of rapid disintegration. Hawes, Am. Jour. Sci., Vol. IX, 3d, 1875, p. 188.

† Rep. Tenth Census.

expose fresh surfaces to be acted upon. Certain of the ferruginous cements are likewise susceptible to the influence of the acidulated rains, though the anhydrous oxides occurring in the Potsdam stones are, according to Julien, less soluble than are the hydrated forms occurring in those of Triassic age.* The feldspars of granites and other rocks are also susceptible to the same influence, though naturally in a much less degree. The acidulated rains aided by the disintegration produced by temperature changes may in time partially remove, in the form of carbonate, the alkalies—potash and soda—and the rock slowly disintegrates into sand and clay. The feldspars of the gneiss, used so extremely in years past in and about Philadelphia, are said to have proved peculiarly liable to this change, and it has been found necessary in many instances to paint some of the older structures formed from it to avoid serious disintegration.

(3) INDURATION OF STONE ON EXPOSURE.

The changes produced by weathering are not in all cases those of decomposition. All stones, and especially the limestones and sandstones, undergo at first a process of hardening on being removed from the quarry or when exposed in the quarry bed, as will be noted further on. This hardening is explained by Newberry and others on the supposition that the water with which the stones are permeated, holds in solution, or at least in suspension, a small amount of siliceous, calcareous, ferruginous or clayey matter. On exposure to the atmosphere this *quarry water*, as it is technically called, is drawn by capillarity to the surface of the block and evaporated. The dissolved or suspended material is then deposited, and serves as an additional cementing constituent to bind the grains more closely together. It is obvious that the amount of induration must in most cases be quite small, and limited to but a thin outer crust on each block; also that when this crust has once formed it can, if removed, never be replaced since the stone in the walls of a building is cut off from further supply of quarry water, and as a matter of course, after whatever quantity contained within its own mass has come to the surface and evaporated, no further hardening by this means can take place. This induration sometimes takes place in a peculiarly rapid and interesting manner. Dr. Wadsworth, in writing on some Potsdam and St. Peter's sandstones near Mazo Manie, Wis.,† states that those portions of the stone which are exposed to atmospheric influences have become by induration converted into compact quartzites, while the protected portions still retain their porous and friable nature. So rapidly does this change take place that an exposure of but a few months is sufficient to produce very marked results on a freshly broken surface.

It is on this account that the practice of setting rough stone in a

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*Julien, Rep. Tenth Census, Vol. x, p. 776.

†Proc. Bos. Soc. Nat. Hist., Vol. xxii, 1883, p. 202.

wall, and leaving them to be carved when the structure is completed, is stongly condemned by some,* as in so doing the hard outer crust that began to form as soon as the stone was exposed to evaporation is entirely removed, and the delicate carving disintegrates much more rapidly than otherwise would have been the case. The carving, it is argued, should be done at once, while the quarry water is still present, and the crust then forms upon its surface, and it is thus better able to resist atmospheric action. The rescouring and honing of buildings and works of art is strongly objected to on similar grounds.†

(7) WEATHERING PROPERTIES OF STONES OF VARIOUS KINDS.

We will now consider the effects of the various agencies just enumerated upon the different classes of rocks in common use for building materials.

Granites are liable to disintegration chiefly from the constant expansion and contraction caused by natural temperatures. The chemical changes to which they are subject, such as the kaolinization of the feldspars or rusting of the micas, being as a rule scarcely noticeable in the walls of a building, while they are so compact as to be practically non-absorbent, and hence not liable to injury by freezing alone. The same may be said respecting the diabases, melaphyrs, and basalts when not particularly rich in magnetite or secondary calcite. Dr. Hague, in describing the decay of the granite obelisk in Central Park, New York, says: "In my opinion the process of disintegration has been an extremely slow one, caused by a constant expansion and contraction of the constitutent minerals near the surface, due to diurnal variations of temperature. In a climate like that of New York, where these diurnal changes are frequently excessive at all times of the year, the tension between the minerals would naturally tend to a mechanical disintegration of the rock. Granite being a poor conductor of heat, the effect of these changes would be felt only at short distances below the surface, causing in time minute fractures and fissures along lines of weakness. Into these openings percolating waters, upon freezing, would rapidly complete the work of destruction."‡

The decay of the obelisk since it reached New York, then, has been simply mechanical and not chemical. The same has been found true by Professor Julien of certain granites used for building in New York City.§

Helmerson explains the rapid disintegration of the Alexander column in St. Petersburg, Russia, on the grounds that it contains many large crystals of a triclinic feldspar, which when subjected to the extreme temperatures of Russian climate expand and contract unequally in the direction of their three crystallographic axes and hence cause the

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* Le Duc, Story of a House, p. 143.

† See Chateau, under "Inconvénience du grattage à vif," p. 353.

‡ Science, December 11, 1885, p. 511.

§ *E. g.*, the old "Tombs" building on Center street.

crumbling.* This view seems plausible, but we believe it yet remains to be shown that rocks rich in triclinic feldspars in reality disintegrate more rapidly than others.

Granite was for a long time popularly believed to be a nearly fire-proof material. The great fires of Portland, Boston, and Chicago not merely exposed this delusion but proved the direct opposite—that instead of being the most fire-proof it was the least so, ranking below either sand or limestone. The peculiar susceptibility of the stone to the effect of heat may be ascribed to its compact and complex structure, each of its constituent minerals possessing different degrees of expansibility.†

It has also been suggested by certain authors that the minute water-filled cavities in the quartz of these rocks may be an important factor, since, when highly heated, the water is converted into steam and an explosion results, causing the quartz to fly into fragments.‡

The relative durability of sandstones and granite under fire is stated to have been well shown not long since at the burning of St. Peter's Church at Lamerton, England. The church itself, which was built in great part of granite, was completely ruined, while the tower, built of a local freestone, around which the heat of the fire was so great as to melt six of the bells as they hung in the belfry, was left intact, although the granite window-jams and sills were destroyed.§

Limestones and dolomites, both marbles and the common varieties, are perhaps less affected than granite by the purely mechanical agencies, but make up for this in their susceptibility to the solvent action of gaseous atmospheres. Limestones are in this respect less durable than dolomites, so that, the tenacity being the same, a dolomite might, under the same circumstances, be considered as promising greater durability

* See Science, January 22, 1886, p. 75.

† The co-efficient of cubical expansion for several of the more common rock-forming minerals has been determined as follows:

Quartz	.000036	Tourmaline	.000022
Orthoclase	.000017	Garnet	.000025
Adularia (feldspar)	.0000179	Calcite	.00002
Hornblende	.0000284	Dolomite	.000035
Beryl	.000001		

The quartz, it will be noticed, has a co-efficient of expansion double that of the orthoclase, and nearly a third greater than hornblende. The matter is further complicated by the fact that each individual mineral expands unequally along the direction of its various axes. Thus quartz gives a co-efficient of .00000769 parallel to the major axis, and of .00001385 perpendicular to this axis; adularia gives .0000156, .000000659, and .00000294 for its three axes; and hornblende for the same axes gives .0000081, .00000084, and .0000095. (See Clarke's Constants of Nature, Smithsonian Misc. Coll., Vol. XIV.)

‡ After a microscopic examination of thin sections of all our granites, such as are used for building purposes, the author can but feel that in most cases the results thus produced are too small to need serious consideration.

§ Am. Arch., Vol. IV, 1878, p. 80.

than a limestone (see p. 350). A thoroughly crystalline or non-crystalline compact and homogeneous limestone or dolomite is scarcely, if any, more absorbent than a granite, and hence it is as little liable to injury from freezing. Professor Geikie, in studying rock-weathering as displayed by the marble tombstones in Scottish cemeteries, observed that the process presented three distinct phases, all of which were at times observable on the same slab. These were (1) *superficial solution*, caused by the carbonic and sulphuric acids of the atmosphere; (2) *internal disintegration*, accompanied or preceded by the formation of an exterior coat or film of sulphate of lime; and (3) *curvature and fracture*. The first phase manifested itself in loss of polish and gradual roughening of the surface, followed by the formation of minute rifts and final rapid disintegration. One case is mentioned in which a stone erected in 1785 became so far decayed as to require restoration in 1803, and at the time of writing (1880) was and had been for some years so corroded as to be entirely illegible.

The second phase, that of internal disintegration, manifested itself in a peculiar manner. In a number of cases examined it was found that the sulphuric acid brought in contact with the stone by rains had reacted upon the calcium carbonate, producing a superficial coating, varying in thickness from that of a sheet of paper to a millimeter, of sulphate of lime. This, so long as it remained intact, seemed to protect the stone from other atmospheric influences. On the breaking of the crust, however, it was found that the cohesion of the crystalline granules beneath had been destroyed and the stone crumbled rapidly to sand, the cause of which is attributed largely to mechanical agencies.

The third phase, that of curvature and fracture, was observed only on thin slabs of marble which had been placed in a horizontal or vertical position and confined by a frame of sandstone. It manifested itself in the bulging outward of the slab like the bellying of a well-filled sail. In one case examined, that of a slab of marble 30¼ inches long, 22⅜ inches wide, by three-fourths of an inch thick, which had been thus secured against a wall, the slab was found to have escaped from its fastenings at the sides, though still held at the top and bottom, and to have bulged outward sufficiently to allow the insertion of the hand and arm between it and the wall at the widest point. It had also expanded laterally so as to be one-half an inch wider in the center than at the ends. The outer surface of the slab where the greatest strain was produced by the bending was filled with minute cracks or rifts, the largest of which were some one-tenth inch in diameter. The cause of the bulging is believed by Professor Geikie to be due to expansion caused by the freezing of water absorbed from rains.*

Professor Geikie's conclusions from the examination of a large number of cases were to the effect that in all but exceptionally favorable and sheltered localities slabs of marble exposed to the weather in such

*Geol. Sketches, pp. 170–172.

a climate as that of Edinburgh lost their polish after an exposure of but a year or two and became entirely destroyed in less than a century; hence that the stone was quite unfitted for outdoor work in that vicinity. These results are greatly in exaggeration of what takes place in our own cemeteries. Professor Julien states that in the city cemeteries about New York the polish on marble tombstones often survives for ten years, and in protected places, as near the ground in suburban cemeteries, for half a century. He further states that while of the tombstones in St. Paul's churchyard in New York City, about one-tenth of the inscriptions dating back to the latter part of the eighteenth century are illegible, he has never seen the same effect produced in suburban cemeteries in the same length of time. The author's own observations on the subject are to the effect that in the cemeteries of the smaller towns and cities of New England marble tombstones will retain their polish for a period of ten or fifteen years and up to thirty or thirty-five present no sign of disintegration of a very serious nature. Beyond this time, however, the surface becomes rough and granular and the edges of the stone may be found filled with fine rifts into which particles of dirt become lodged or lichens take root, giving it a dirty and unkempt appearance.*

Such stone are frequently taken down, rehoned and polished, and again set up to do duty for another term of years. A closely crystalline or non-crystalline, compact, and homogeneous limestone is probably as little affected by frost as are the granites. Very many of the limestones and dolomites used for ordinary building are, however, by no means sufficiently non-absorbent to protect them from injury by freezing, nor are they sufficiently uniform in texture to weather evenly, the disintegration going on more rapidly in some layers than others, thus producing rough and unsightly walls. Professor Winchell, writing on the weathering of the Trenton limestone used at Saint Paul and Minneapolis, says:† "The stone itself has an attractive and substantial aspect when dressed under the hammer, the variegations due to the alternating shaly and limy parts giving the face a clouded appearance, as of gray marble, without being susceptible of a uniform polish. Where protected from the weather the shale will endure and act as a strong filling for the frame-work of calcareous matter for a long time; but under the vicissitudes of moisture and dryness, and of freezing and thawing, it begins to crumble out in a few years. This result is visible in some of the older buildings, both in Saint Paul and Minneapolis." Professor Hall, writing on rock weathering,‡ says: "In the gray or bluish-gray subcrystalline limestones the argillaceous matter, instead of being distributed throughout the mass, is usually present in the

* The fine grained saccharoidal marbles used for statuary are even less durable, and in extreme cases have shown serious disintegration at the end of three or four years exposure.

† Preliminary Report on Building-stones, etc., 1880, p. 13.

‡ Report on Building-stones, p. 36.

form of seams which are parallel to the lines of bedding or distributed in short, interrupted laminæ. These seams, whether continuous or otherwise, are fatal to the integrity of the stone, and there is scarcely a limestone structure in the country, of twenty-five years standing, which is not more or less dilapidated or unsightly, from the effects of absorption of water by the clay seams, and the alternate freezing and thawing. When laid in the position of the original beds, which is the usual mode, the separation by the clay seam is slower; but when used as posts or pillars, with the lines of bedding vertical, the change goes on more rapidly."

Sandstones, on account of their widely varying textures and degrees of compactness, together with an equal variation in composition and character of cementing materials, are influenced, to a greater or less extent, by all the atmospheric influences enumerated. In the order of its apparent importance may be mentiond first the effects of freezing. As will be noticed by reference to the tables in the appendix, sandstones will absorb from about one-fiftieth to one-eighth of their weight in water in twenty-four hours, or from 2 per cent. to 12½ per cent. The approximate amount which a stone may absorb with impunity cannot, of course, be stated, since much depends on its position in a building and the strength and structure of the stone itself. It is not too much to say, however, that any stone which will absorb 10 per cent. of its weight of water during twenty-four hours should be looked upon with suspicion until, by actual experiment, it had shown itself capable of withstanding without harm freezing when in this condition. Half of this amount may be considered as too large when the stone contains any appreciable amount of calcareous or clayey matter. (See foot-note, p. 348.)

It is to their great absorptive power that is due the large amount of disintegration and exfoliation seen in the softer sandstones, as the Triassic of the Eastern United States and the sub-Carboniferous of Ohio. When a stratified rock, and especially one that is distinctly laminated, is placed on edge the water filters into it from above, and, there freezing, from necessity produces the scaling so often noted in the Connecticut brownstone. If placed on the bed the effect is not nearly as disastrous, but with a porous stone the effect of continual freezing and thawing can but be injurious. It was with an apparent entire disregard of the probble effect of these agencies that was selected the soft and porous Juro-Cretaceous sandstone from Acquia Creek, Virginia, for the construction of the White House, central part of the Capitol, and other public and private buildings in Washington, a stone so susceptible to these influences, that it is only by a most prodigal use of paint and putty that the buildings are kept in a condition at all presentable.*

* Other reasons than that of lack of durability can be given against the use of a too porous stone in a house wall. "A red sandstone house may be a very handsome building, but then it may be holding tons of water, and such a wall, if exposed to the *north*west, in an open country, in our neighborhood, in a rainy winter, would, no

Acid gases are naturally without effect upon the silicious particles of a sandstone, and can be productive of injury only in dissolving out the ferruginous and calcareous cements. This is actually accomplished in many cases, and much disintegration results as a consequence. Indeed, Egleston* seems to regard the serious decay into which the stone of Trinity Church, New York, has fallen, to be due chiefly to this cause, supplemented by the action of frost after the cement had been removed and the stone thus rendered porous. The relative solubility of the various ferruginous cements has been already alluded to (ante p. 339). Oxidation is likely to play a more noticeable part in sandstones than in most other rocks, owing to their porous nature, which allows ready access of water and air. The effect of oxidizing pyrite in producing the mellowing and other color changes in stones of this class is sufficiently dwelt upon elsewhere, as is also the effect of heat, both natural and artificial.

On account of their porosity and natural roughness of surface sandstones are of all stones most likely to afford foothold for the growth of algæ, lichens, and mosses. While it is yet to be proven that these are actually injurious, they are at least suggestive of an unhealthy dampness. A stone once covered by these organisms will absorb more water and give it up more slowly to evaporation than one whose surfaces are not thus protected.

Serpentines when free from bad veins are as a rule non-absorptive and not affected by gaseous atmospheres, hence are durable if free from bad joints. The Pennsylvania serpentines sometimes turn whitish on exposure, but so far as observed do not disintegrate.

Soapstone, although too soft and possibly too slippery for general building, is nevertheless one of the most durable stones, being not only proof against atmospheric and chemical agencies, but when well seasoned fire-proof as well.

Gypsum is too soft and too soluble in ordinary terrestrial waters to be of great value.

I.—ON THE SELECTION OF BUILDING STONE.

(1) GENERAL CONSIDERATIONS.

From what has gone before it must be evident that there are many more factors which go to determine the value of stone for structural purposes than are ordinarily taken into consideration. It may therefore not be out of place here to mention a few general principles to be observed in selecting stone for any purpose in which durability or stability of color are matters of importance. It should be stated at the

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doubt, get saturated. This means expending more fuel to convert part of this water into vapor. The difficulty is surmounted to a great extent by building hollow walls, the inner wall being of brick. Woe unto the man who has not taken this precaution." (T. Mellard Reade, in Proc. Liverpool Geological Soc., p. 445 and 446, 1883–84.)

*Cause and Prevention of Decay in Building Stone. Trans. Am. Soc. Civ. Engs. xv, 1886.

outset that the problem of ascertaining by laboratory or other tests the actual qualities, good or bad, of any stone, is peculiarly complicated and difficult.* In the present state of our knowledge nothing like definite rules of procedure with any probability of accurate and reliable results can be given. That the difficulties may be better appreciated it may be well to note here the main points to be considered. In the order of their apparent importance they are:

(1) Resistance to changes in temperature.

(2) Resistance to chemical action of the atmosphere.

(3) Crushing strength and elasticity.

(4) Resistance to abrasive action of feet and wind-blown sand.

The order as above given may be subject to modification to suit individual cases. In many instances the actual strength of a stone is a matter of little importance, and in protected situations the quality mentioned under (4) may be wholly left out of consideration. In still other cases, as in bridge abutments, strength and elasticity are matters of greatest import, while that of change of color can have no essential value. In the arrangement given above, especial regard has been had to stone exposed in the exterior walls of a building, and in a varied climate like that of the northern and eastern United States.

The first item for consideration is then the matter of climate. This, together with the location in which a structure is to be erected, with especial reference to proximity to large cities and manufacturing establishments, and even the directions of the prevailing winds and storms, are of primary importance and need consideration as well as do the physical and chemical properties of the stone itself.†

Our Northern and Eastern States, with an annual precipitation of some thirty-nine or forty inches and a variation in temperature amounting in some cases to not less than 120°, are necessarily more trying than those where the precipitation is less or the temperature more uniform. There is many a porous sand or lime stone which could endure an exposure of

* See article "On the testing of building-stone," by the writer in American Architect for February 16, 1889.

† "As an instance of the difference in degree of durability in the same material subject to the effects of atmosphere in town and country we may notice the several frustra of columns and other blocks of stone that were quarried at the time of the erection of St. Paul's Cathedral in London, and which are now lying in the island of Portland, near the quarries from where they were obtained. These blocks are invariably found to be covered with lichens, and although they have been exposed to the vicissitudes of a marine atmosphere for more than one hundred and fifty years they still exhibit beneath the lichens their original forms, even to the marks of the chisel employed upon them, whilst the stone which was taken from the same quarries and placed in the cathedral itself is in those parts which are exposed to the south and southeast winds found in some instances to be fast moldering away." (Gwylt's Encyclop. of Arch., p. 458.)

It is stated that in England the northern part of a building is always in a better state of preservation than the southern, owing to the more uniform amount of moisture and less heat from the sun.

hundreds of years in a climate like that of Florida or New Mexico, but which would probably be found in a sad state of disintegration at the end of a single season in some more northern State.

We are accustomed to hear a great deal regarding the wisdom of the ancients, and especially the Egyptians, as shown in the selection of enduring materials for their obelisks and monuments,* a wisdom or prudence which modern builders "admire more than they imitate," and we are referred to the still legible inscriptions and sharp sculptures on the surfaces of these obelisks, even after thousands of years of exposure, as proof of this marvelous foresight on the part of a semi-barbarous people. It must be borne in mind, however, that nature herself had vastly more to do in this matter than Egyptian foresight, and it is more than probable that at that time materials were selected with as little regard for their lasting qualities as they are to-day. The Syene granite, so durable under Egyptian skies, is no better than those in common use in this country, as the transported obelisks in New York and London have plainly shown. It is a matter of climate more than of material, and this fact should never for a moment be ignored. Were the climate of the United States like that of Egypt, southern Italy, or Mexico there would have arisen no occasion for the compilation of this chapter.†

(2) PRECAUTIONS TO BE OBSERVED.

The precautions which should be observed in selecting a stone for building purposes may here be briefly alluded to.

In those portions of the northern and eastern United States that have been subjected to glacial action,‡ and where the great mass

* *Vide* Matériaux de Construction, par L. Malécot, p. 30.

† "From the manner in which the buildings and monuments of Italy, formed of calcareous materials, have retained to a wonderful degree the sharpness of their orginal sculpturing, unless disfigured by the hand of man, it is clear that a dry and smokeless atmosphere is the essential element of durability. In this respect, therefore, the humid sky and gaseous atmosphere of British towns must always place the buildings of this country at a comparative disadvantage as regards durability." (Hull, p. 282.)

"La Grèce, la Basse Italie, et notamment la Sicile, dit il, ont cet étrange privilége que tout s'y conserve intact, presque sans se détériorer, pendant des siècles consécutifs. Aussi les monuments, les statues, les marbres blancs eux-mêmes, qui, chez nous (en France), deviennent noirs en deux ans, rouges en dix ans, ruinés en cinquante, chez eux sont à peine noircis au bout de trois ou quatre siècles d'exposition en plein air. Sous terre ou dans un appartement ils gardent intactes leur forme et jusqu'à leur blancheur, à perpétuité pour ainsi dire.

J'ai vu retirer de terre à Pouzzole, près de Naple, des marbres enfouis depuis plus de deux mille ans, qui avaient l'air de sortir des mains du sculpteur.

A Palerme, les statues et les marbres en plein air sont, il est vrai, assez noirs; mais ils n'ont jamais été touchés, m'a-t-on dit, depuis leur mise en place, et il y a là des statues qui datent de dix siècles." (E. Carrey, as quoted in Malecot's Matérianx de Construction, p. 31.)

‡ This includes all of New England and those portions of other States lying north of a line running irregularly from a point near the western end of Long Island

of rotten rock that had accumulated during previous geologic ages has been entirely removed, if the surface of the rock as displayed in the quarry or natural outcrops presents a fresh and undecomposed appearance, this may be construed as a strong argument in its favor, though it can not in all cases be accepted as conclusive.* A purely calcareous rock may weather rapidly and yet leave no débris, since its constituents are soluble and may all be carried away by running water, leaving no traces to tell of the havoc going steadily on. Impure limestones and all silicious rocks, however, leave more or less débris as mark of their decay.

But in regions south of the glaciated area the rock is still covered by the decomposed mass, and hence no clew can thus be obtained. In such cases one can only have recourse to structures that have already been erected from the stone in question and there observe its weathering qualities, or, if these are lacking, observe the stone in those parts of the quarry that have not recently been worked. In opening a new quarry, blocks should always be tested by allowing them to lie and season for at least a year before using. At the end of this time the presence of any readily oxidizable pyrite will have made its presence known, and the amount of disintegration, or induration, as the case may be, will furnish a slight clew regarding its future behavior. Indeed, this seasoning of stone prior to its introduction into a building should always be insisted upon, whatever its character. A good building stone, whatever its kind, should possess a moderately fine and even texture, with the grains well compacted, should give out a clear ringing sound when struck with a hammer† and show always a clean fresh fracture. It should also be capable of absorbing only a proportionally small amount of water.‡

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across New Jersey; thence northwesterly across Pennsylvania into New York State south of Buffalo; thence southwesterly to near central Ohio; thence due south nearly to the Ohio River; westerly along the river to a point north of Louisville, Ky.; thence northerly again nearly to Indianapolis, Ind.; thence southwesterly so as to include nearly all of Illinois; thence northwesterly to a point near Saint Louis; westerly toward Jefferson City, Mo.; thence along the Osage River and northwesterly through Kansas near Topeka; through the eastern half of Nebraska, through Dakota west of Bismark, and thence onward into Montana.

* "No artificial structure or position will ever subject the stone to the same degree of weathering influence to which it is exposed in its natural position. * * * The rock which has withstood these influences is quite equal to withstand the exposure of a few centuries in an artificial structure." (Hall Rep. on Building Stone, p. 24.)

† In a report on some experiments on the transverse strength and elasticity of building stone, Mr. T. H. Johnson states "the resonance of each piece tested was proportional to the modulus of elasticity as found by the test." (Rep. State Geol. of Ind., 1881, p. 38.)

‡ En un mot, les qualités essentielles des pierres tant dures que tendres sont d'avoir le grain fin et homogène, la texture uniforme et compacte; de résister à l'humidité a la gelée, et de ne pas élater au feu en cas d'incendie. (Chatean, Vol. I, p. 272.)

Any sandstone weighing less than 130 pounds per cubic foot, absorbing more than 5 per cent. of its weight of water in twenty-four hours, and effervescing anything but *feebly with acids,* is liable to prove a second-class stone as regards durability where *there is frost or much acid in* the air." (Notes on Building Construction, p. 36.)

The porosity of any stone is usually characteristically shown by its manner of drying after a rain; some will dry quickly, while others that have absorbed a larger quantity of water will remain moist for a long time. In the case of a sandstone it may be said that the grains should be closely compacted, so that the proportion of cement necessary to entirely fill the interspaces is comparatively small. Of all cementing materials the argillaceous and calcareous are the least durable, and the purely siliceous the most so, the ferruginous cements standing intermediate in the series. Indeed a purely siliceous sandstone cemented closely by a siliceous cement may be classed as one of the most durable of stones, although unfortunately on account of their hardness and poor colors such can be utilized only at a considerable expense and not always with good effect. Professor Geikie* mentions an instance in which a fine siliceous sandstone erected as a tombstone in Greyfriars churchyard about 1646, and defaced by order of the Government in 1662, still showed the marks of the defacing chisel upon its polished surface after a lapse of over two hundred years.

(3) COMPARATIVE DURABILITY OF STONES OF VARIOUS KINDS.

In this connection the following table upon the "life" of various kinds of building stone in New York City is of interest; by the term *life* being understood the number of years that the stones have been found to last without discoloration or disintegration to the extent of necessitating repairs.

	Life in years.
Coarse brown-stone	5 to 15
Fine laminated brown-stone	20 50
Compact brown-stone	100 200
Blue-stone (sandstone), untried, probably centuries.	
Nova Scotia sandstone, untried, perhaps	50 200
Ohio sandstone (best siliceous variety), perhaps from one to many centuries.	
Coarse fossiliferous limestone	20 40
Fine oolitic (French) limestone	30 40
Marble, coarse dolomitic	40
Marble, fine dolomitic	60 80
Marble, fine	50 100
Granite	75 200
Gneiss, 50 years to many centuries.†	

The fact that certain quarries have furnished good material in the past is no guarantee of the future output of the entire quarry. This is especially true regarding rocks of sedimentary origin, as the sand and limestones, different beds of which will often vary widely in color, texture, composition, and durability, though lying closely adjacent. In many quarries of calcareous rocks in Ohio, Iowa, and neighboring States, the product is found to vary at different depths all the way from a pure limestone to magnesian limestone and dolomite. The

* Geological Sketches, p. 175.

† Julien, Rep. Tenth Census, 1880, p. 391.

cause of this remarkable variation is little understood and can not here be touched upon,* but the fact that such occurs is of importance, since in many and perhaps the majority of cases an equal variation exists in point of durability. By English as well as many other authorities a dolomite is, other things being equal, considered more durable than a limestone, and beyond doubt this is the case in localities where the atmosphere is at all acidic, since dolomite, as already noted, is but little affected by these agencies. Aside from this it would seem yet to be proven that, in the United States, a pure limestone was less durable than one that contained the necessary magnesia to constitute a true dolomite.† Indeed, Professor Hall considers the magnesian limestones, as a whole, "more friable, more porous, and less firm" (and consequently less durable) than the pure limestone.‡

Stones which are mixtures of limestone and dolomite are liable to weather unevenly, the limestone crystals becoming eaten out, while the dolomite particles are left to project and impart a rough and lusterless surface.

Coarsely fossiliferous stones are usually to be avoided for exposed work, as they weather unevenly, owing to the unequal hardness of the fossils and the matrix in which they are embedded. Thus the coarse gray Niagara limestone from Lockport, N. Y., used in the construction of the Lenox Library building in New York City, began to show signs of decay even before the structure was completed. It should be remarked, however, that this extreme rate was due in part to the fact that the stone was laid on edge and not on the natural bed. Mr. Wolff§ mentions a case of a monument of shell marble in a Boston cemetery, in which, after seventy years' exposure, the fossil shells stand out in bold relief; the stone is also covered with fine cracks and is otherwise decomposed.‖

Veined stones are also subject to unequal weathering when exposed; this being due to the unequal hardness of the vein matter and the mass of the rock. This is true of all stones, but is especially noticeable in

* Interested parties should consult such works as Geikie's text book of Geology and Prestwich's Chemical and Physical Geology and the authorities there alluded to.

† "The nearer a magnesian limestone approaches a dolomite in composition the more durable it is likely to be." "In the formation of dolomite some peculiar combination takes place between the molecules of each substance; they possess some inherent power by which the invisible or minutest particles intermix and unite with one another so intimately as to be inseparable by mechanical means. On examining with a high magnifying power a specimen of genuine magnesian limestone * * * it will be found not composed of two sorts of crystals, some formed of carbonate of lime and others of carbonate of magnesia, but the entire mass of stone is made up of rhomboids, each of which contains both earths homogeneously crystallized together. When this is the case we know by practical observation that the stone is extremely durable." (Smith's Lithology, Building Const., p. 40.)

‡ Rep. Tenth Census, p. 290.

§ Rep. on Building-Stone, p. 40.

‖ The limestone of which was constructed the State capitol building at Nashville, Tenn., has proved so inferior, owing to the weathering out of the numerous fossil orthocera, that the quarries have been discontinued on this account alone.

the so-called verdantique marbles, where the white veins of calcite or dolomite lose their polish and crumble away more rapidly than the serpentine composing the bulk of the rock. Good examples of this are to be seen in the bases of the two statues in front of the City Hall in Boston. Stones which, like many marbles, contain seams of mica, talc, or other minerals, are objectionable for like reasons. Thus the marble column supporting the statue of Lincoln in front of the City Hall at Washington, though having been in place but some twenty years, is to-day cracked from top to bottom, owing to the opening of one of these seams of talc. It may be stated further that in the majority of marbles and such other stones as are used chiefly for decoration work, those variously colored lines and veins or structural features which give the stone its chief beauty are in reality flaws and lines of weakness. There is many a beautiful imported marble which when sawn into a thin slab will scarcely bear its own weight, but must be backed by cheaper and stronger material.

It may be said here that the essential qualities of a marble, aside from color, which may vary almost indefinitely, are that it shall possess a texture sufficiently compact and hard to take a smooth surface and acquire a high polish. The chief defect in nearly all American marbles, and one that does not as yet seem to be fully realized, is that they are too coarsely crystalline. This not only renders the production of a perfect surface difficult, but the cleavage facets frequently reflect the light from below the surface in such a way as to destroy its uniformity. However good the color may be, a stone of this nature must always rank lower than one that is so fine grained as to appear non-crystalline or amorphous. It is this fact, and this alone, that renders the American marbles now in the market inferior to such as are imported from Belgium, the French Pyrenees, Italy, or northern Africa. Those who are seeking new sources of material will do well to bear this in mind.*

Time of quarrying.—The season of year during which a stone was quarried may also, in certain cases, be worthy of note. It is well known that many stones can be quarried with safety only during the summer season, but Grüber goes a step further and states† that while the best time for quarrying is during the summer, the freshly quarried material should not be allowed to lie in the sun and dry too quickly, as it is liable thereby to become shaky. This he regards as particularly likely to happen to sandstone. Stone quarried in winter, or during very wet seasons, is liable, according to this authority, to have but slight tenacity when dried, and to remain always particularly susceptible to the effects of moisture. Finally, he states, a stone is liable to disintegration if built immediately into a wall without seasoning. Stones for carved work are to be quarried in the spring, since such longest retain their quarry water, and this, if once lost, no subsequent wetting can restore.

* Stone, Indianapolis, Ind., February, 1889.

† Die Baumaterialien-Lehre, p. 61.

K. METHODS OF PROTECTION AND PRESERVATION.

(1) PRECAUTIONARY METHODS.

Position in wall.—All authorities agree that stratified stone should be placed in the walls with the bedding horizontal, or at right angles to the direction of greatest pressure. Not only are they as a rule strongest in this position, but as they will absorb less water they are correspondingly less liable to suffer from the effects of frost. This fact has already been sufficiently dwelt upon. The denser and harder stones should as a rule be used in the lower courses; the lighter ones in the superstructure. The non-absorbent stones should be used in the ground and in plinths, sills, strings, courses, and weather beds of cornices, etc.; the softer and more absorbent ones may be used for plain walling.*

The necessity of laying non-absorbent stones in the ground becomes apparent when we consider that in this position they are in contact with more or less moisture, which, when absorbed, is liable to cause discoloration and damp, unhealthy walls. If from necessity porous stone are used, a coating of water-proof material, as asphalt, should be interposed between those courses that are in contact with the ground and those of the superstructure.†

In laying the lower courses of Lee dolomite in the walls of the Capitol at Washington, the stone was observed to show a brownish discoloration, due to the absorption of unclean water from the mortar. This was finally remedied by coating the lower surfaces of the stones where they came in contact with the mortar with a thin layer of asphalt which prevented such absorption and thus removed the difficulty.‡

No one who has given the subject any attention can have failed to remark how, in town and city houses constructed of the Connecticut or New Jersey brown sandstones, the blocks in the lower courses—those in close proximity to the sidewalks—almost invariably scale after an exposure of but a few years, while those in the courses above remain intact for a much longer period. This is due to the fact that these lower courses are kept almost constantly wet, receiving not only the water that falls as rain upon the walls above, but also that which splashes from the walk or is absorbed from the ground. As noted by Chateau (*op. cit.*, p. 352), it is not those portions of a wall that receive the water from rains direct that are most and earliest liable to decomposition, but the under and partially protected portions, as those under the cornices,

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* Cyclopedia of Arts and Sciences, Vol. VII, p. 839.

† T. Eggleston, Am. Arch., Sept. 5, 1885. This authority states further, that in the exterior walls of Trinity Church, New York, the stone for the first 60 or 70 feet in height is more decomposed than above this point. This is accounted for in part on the supposition that the atmosphere near the ground contains a larger proportion of acid gases than at higher altitudes.

‡ Sill. Jour., XXII, 1856, p. 36.

the entablatures and the "tablettes" of balustrades upon which the water drips or runs more slowly. It is for this reason that architects advocate the under-throating of window sills and other projections in order that the water may be thrown off from the building and not allowed to run down over the face of the stone beneath. The disastrous effects from neglect of this proceeding have been dwelt upon by Julien in reference to buildings in New York City. The author has in mind the costly residence of a former Cabinet minister in Washington in which the middle portion of the brownstone entablatures are almost continually wet throughout the winter months by the soaking through of water from above. The stone steps in the same house are constantly wet and show a whitish efflorescence. Both these defects are liable to appear in so porous a material, but might in large part have been averted by exercising proper care in building.

It may not be out of place here to comment on the folly of placing iron railing on steps, platforms, etc., of finely-finished granite, since in spite of paint and other means of protection the iron invariably rusts, staining and badly defacing the entire surface beyond possibility of repair.

The method of dressing a stone has an important bearing upon its durability. As a rule it may be set down that the less jar from heavy pounding the surface is subjected to the better; this for the reason that the constant impact of the blows tend to destroy the adhesive or cohesive power of the grains, and thus renders the stone more susceptible to atmospheric influences. It is stated by Mr. Batchen that some of the dolomites used in Chicago, although apparently perfectly sound when quarried, shortly showed a tendency to scale on exposure. On examination it appears that in dressing these surfaces were both ax- and bush-hammered, the implements used weighing from 8 to 12 pounds, and capable of striking blows of not less than 150 or 200 pounds. The effect of these heavy blows was to "stun"* the surfaces for the depth of from one-sixteenth to one-eighth, or even one-fourth, of an inch, and on exposure scaling resulted, leaving them ragged and unsightly. Sawn surfaces of the same stone, on the contrary, do not usually show the slightest tendency to scale.

Results such as these are what one is naturally led to expect, but further experiments are necessary before it will answer to speak too positively regarding the merits or demerits of various kinds of finish. With compact crystalline rocks like the granites and diabases it would seem probable that rock-faced work, untouched by chisel or hammer, would prove most durable, since the crystalline facets thus exposed are best fitted to shed moisture and the natural adhesion of the grains has not been disturbed†.

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* *I. e.*, to break the grains and produce minute fissures.

† The single experiment of Pfaff, in which a polished granite was found to weather more rapidly than one unpolished, seems too anomalous to be accepted until further

With the softer and more absorbent stones, on the other hand, the rock surface from its irregularity and roughness is more susceptible to the attacks of moisture and atmospheric acids, and hence would probably be found less durable, although from its roughness at the start any disintegration is less noticeable than on finely finished work. With such stones a smoothly sawn or polished surface seems best adapted to our variable climate.*

(2) PROTECTION BY MEANS OF SOLUTIONS.

Many methods have been devised for checking or altogether preventing the unfavorable action of the weather upon building stone of various kinds, but none of them can be considered as really satisfactory. The problem, as may readily be understood, consists in finding some fluidal substance into which the stone may be dipped or which may be applied with a brush to its outer surface in such a manner as to fill its pores and thus prevent all access of moisture. Whatever the substance, it must be of such a nature as in no way to discolor or disfigure the stone.

Paint.—This is one of the substances most generally used and which has been employed on the porous sandstone of the Capitol, White House, Patent Office, and other public buildings in Washington. It is

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proof is offered. A polished surface must naturally shed water more readily than a sawn or tool-dressed one, and hence it would seem that it should be more durable. It is of course possible that, owing to the manner in which the smooth surface necessary for polishing was produced, the surface minerals were badly shattered, and hence succumbed the more readily on exposure.

* Professor Hall, writing on the methods of dressing certain argillaceous limestones (Rep. on Building Stones, p. 36–37), says: "In the dressing of limestone the tool crushes the stone to a certain depth, and leaves the surface with an interrupted layer of a lighter color, in which the cohesion of the particles has been partially or entirely destroyed; and in this condition the argillaceous seams are so covered and obscured as to be scarcely or at all visible, but the weathering of one or two years usually shows their presence.

"The usual process of dressing limestone rather exaggerates the cause of dilapidation from the shaly seams in the material. The clay being softer than the adjacent stone and the blow of the hammer or other tool breaks the limestone at the margin of the seam and drives forward in the space little wedge-shaped bits of the harder stone. A careful examination of dressed surfaces will often show the limestone along the seam to be fractured with numerous thin wedge-shaped slivers of the stone which have been broken off and are more or less driven forward into the softer parts. In looking at similar surfaces which have been a long time exposed to the weather, it will be seen that the stone adjacent to the seam presents an interrupted fractured margin, the small fragments having dropped out in the process of weathering. Limestones of this character are much better adapted to rough dressing, when the blows are directed away from the surface instead of against it, and when the entire surface shall be left of the natural fresh fracture. By this process the clay seams have not been crushed, nor the limestone margining them broken, and the stone withstands the weather much longer than otherwise. The attempt at fine hammer-dressing is injurious to any stone, for the cohesion of the particles is necessarily destroyed, and a portion of the surface left in a condition to be much more readily acted upon by the *weather.*"

found necessary to renew the coating every two or three years, and even then the results are unsatisfactory.

Oil.—This, as stated by Julien,* always discolors a light colored stone, while it renders a dark colored one still darker. According to this authority the oil is applied as follows: The surface of the stone is washed clean, and after drying is painted with one or more coats of boiled linseed oil, and finally with a weak solution of ammonia in warm water. This renders the tint more uniform. This method has been tried on several houses in New York City, and the water-proof coating thus produced found to last some four or five years, when it must be renewed.

Paraffine.—This, dissolved in coal-tar naphtha, is spoken of,† but is not recommended. A better method, as suggested by Julien,‡ consists in brushing over the surface of the building with melted paraffine and then heating it gently until it has been nearly all absorbed into the pores of the stone. This produces little or no discoloration, but it is thought doubtful by some if the heating of the stone is not more injurious than the paraffine is beneficial.

The preparation used in coating the Egyptian obelisk in Central Park, New York, is said by Mr. Caffal§ to have consisted of paraffine containing creosote dissolved in turpentine, the creosote being considered efficacious in preventing organic growth upon the stone. The melting point of the compound is about 140° Fahrenheit. In applying, the surface to be coated is first heated by means of especially designed lamps and charcoal stoves, and the melted compound applied with a brush. On cooling it is absorbed to a depth dependent upon the degree of penetration of the heat. In the case of the obelisk, Mr. Caffal states that, in his belief, it was absorbed to the depth of half an inch. Some 67¾ pounds of the material was used in going over the 220 square yards of surface. An equal surface of brown sandstone is stated to require ordinarily about 40 or 50 pounds. The cost of treating an ordinary 25-foot brownstone front, with a porch, is given by this authority at from $200 to $300. This process, like the last, has been objected to by some on the ground that the heating was liable to injure the stone. Just how much injury is likely to result from a temperature lower than that of boiling water, it is perhaps yet too early to say. It seems scarcely possible that a good quality of sandstone laid on its bed could be at all affected; neither, it is safe to say, would brick.

Soft soap and alum solution.—This, as given by Julien, consists of three-fourths of a pound of soft soap to 1 gallon of boiling water and one-half a pound of alum in 4 gallons of water. It is said to answer well in exposed situations in England, but to require frequent renewal.

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* Tenth Census, p. 389.

† Notes on building construction.

‡ *Op. cit.* 389–90.

§ Trans. N. Y. Acad. Sci., Nov., 1885, p. 66.

Various solutions of beeswax, rosin, and coal tar have also been tried with indifferent success.

Ransome's process.—This consists in saturating the stone as far as practicable with a solution of silicate of soda or potash (water glass) and afterwards applying a solution of chloride of calcium. This last coming in contact with the silicate produces by double decomposition an insoluble silicate of lime, cementing the grains of which the stone is composed firmly together.*

"The solution of silicate is first applied in a dilute form so as to be absorbed readily into the pores of the stone. Several coats are applied with an ordinary whitewash brush and when thoroughly dry the surface is washed with rain water, again allowed to dry, and the calcium solution applied in the same manner. The precautions to be used are: (1) the stone must be clean and dry before applying the solution; (2) the silicate must be applied until the stone is fully saturated, but no excess must be allowed to remain on the surface; (3) the calcium must not be applied until after the silicate is dry; a clear day or so should intervene if possible; (4) care must be taken that either solution is not splashed upon the windows or upon painted work, as it can not be removed therefrom; (5) upon no account should the same brush be used for both solutions. Under ordinary circumstances about 4 gallons of each solution will be required for every 100 yards of surface."

Szerelmey's stone liquid is stated to be a combination of Kuhlman's process with a temporary wash of some bituminous substance. The wall being made perfectly dry and clean, the liquid is applied in two or three coats with a painter's brush, until a slight glaze appears on the surface. This composition was used with some success in arresting for a time the decay of the stone in the House of Parliament.†

Kuhlman's process consists in simply coating the surface of the stone with a silicate of soda or potash solution. It is open to the objection that the potash absorbs carbonic acid from the air and produces a disagreeable efflorescence, which, however, disappears in time.

M. Lewins' process consists in coating the surface of the stone with solutions of an alkaline silicate (silicate of potash) and alumina, the latter in the form of sulphate. It is stated that this wash will give so close a surface to sandstone that it can be polished.(?) Either of the solutions can be colored if desired.‡

Very many other solutions have been devised and tried both in Europe and in this country, but which, in the language of Professor Julien, "have in most cases resulted in complete failure, not arresting the exfoliation."

* Dobson, Masonry and Stone-Cutting, p. 141. See also American Arch. and Builder, 1877, II, p. 21, 38, and Notes on Building Construction, p. 79.

† Notes on Building Construction, p 79.

‡ Jour. Franklin Inst., 3rd, lxix, 1875, p. 338.

PART II.

THE ROCKS.

A.—SOAP-STONE.

This, although not properly a building stone, is of sufficient economic importance to merit attention.

(1) COMPOSITION AND USES.

Pure soap-stone is a massive or schistose variety of the mineral talc. In this form it is often called steatite, soap-stone, or pot-stone; chemically, then, it is a hydrous silicate of magnesia of the following composition, according to Dana:* Silica, 62.8; magnesia, 33.5; water, 3.7. The mercantile varieties are, however, nearly always more or less impure, iron sometimes replacing a part of the magnesia, while anthophyllite, pyrite, pyrrhotite and quartz are common accessories. It is soft enough to be easily scratched by the thumb-nail, and has a marked soapy or greasy feeling, two characteristics which readily distinguish it from most other rocks. It can be sawn into slabs or turned on a lathe, and being, when well seasoned, very refractory, is much used for firestones in furnaces and stoves; it is also very extensively used for lining stationary wash-tubs. The finer varieties are, according to Dana, made into images in China, and into ink-stands and similar articles in other countries. It is cut into vessels for culinary purposes in Lombardy, and was so used to some extent by the aborigines of North America. The harder varieties are cut into gas jets, and it is also used in the manufacture of porcelain. "French chalk" is a fine, compact variety used for tracing on cloth and for removing grease spots. The waste fragments are sometimes ground up and used for lubricating machinery. It is also utilized to some extent in the manufacture of so-called mineral paints. The total product of the United States for 1882 has been estimated at about 6,000 tons, with an average valuation of $15 per ton.†

* Manual of Mineralogy and Lithology, p. 305.

† Mineral Resources of the United States, 1883, p. 464.

(2) SOAP-STONES OF THE VARIOUS STATES AND TERRITORIES.

Arkansas.—Specimens of a fine, compact, brecciated steatite have been received at the museum from some 12 miles north of Benton, Salina County. The supply is stated to be abundant.*

District of Columbia.—A small bed of soap-stone of apparently fair quality occurs at Indian Hill, about 2 miles northwest of the city of Washington. It has not as yet been sufficiently quarried to demonstrate its value. Other beds of limited extent occur near Tennallytown, not far from the District line, and on the Woodley Lane road. The beds are interstratified with the micaceous and hornblendic schists of the vicinity, and have a northeasterly and southwesterly strike.

Massachusetts.—Quarries of soap-stone have been worked from time to time in Lynnfield and North Dana, in this State. The Lynnfield stone occurs in connection with serpentine. It is soft enough to be readily cut with an ordinary hand-saw when first quarried, but hardens on exposure. When quarried, which it has not been since 1880, it was used chiefly for stove-backs, sills, and steps. At North Dana the soap-stone quarries were opened as early as 1846, and have at times been quite extensively worked.

New Hampshire.—An extensive bed of fine quality soap-stone was discovered in 1794 at Francestown, in this State, and was worked as early as 1802. Up to 1867 some 2,020 tons had been quarried and sold. In this latter year some 3,700 stoves were manufactured by one company alone. The business has been conducted upon a large scale ever since. The bed has been followed some 400 feet, and the present opening is some 40 feet wide, 80 feet long, and 80 feet deep. Other beds constituting a part of the same formation occur in Weare, Warner, Canterbury, and Richmond, all of which have been operated to a greater or less extent. Five beds of soap-stone also occur in the town of Orford, and an important quarry was opened as early as 1855 in Haverhill. It has not, however, been worked continuously.†

New York.—Soap-stone or talc occurs in abundance in Fowler and Edwards, Saint Lawrence County, in this State. It is said to be of good quality, remarkably tough, and very refractory in fire.‡

North Carolina.—Soap-stone of fine quality occurs in several localities in the southwestern part of this State, the museum collection showing specimens from 7 miles northeast of Murphy, Cherokee County; from 4½ miles from Greenborough, Guilford County; from Alamance County; from Nantehala River, Cherokee County; and from Deep River, Moore County. Of these the Nantehala stone is a pure, nearly white, compact talc, said to be fully equal to the best French chalk. It has been much used as a white earth. The Deep River "soap-stone" is a

*Agr. Min. & Timber Resources of Ark., 1884.

† Geology of New Hampshire, Vol. III, p. 86–88.

‡ Geology of New York, 1838, p. 206.

compact variety of the mineral pyrophyllite. This is also used as white earth. Both these stones are shipped in bulk to New York, where they are ground and bolted. The stones from the other localities are of the ordinary type of soap-stones, but apparently of good quality.

Pennsylvania.—In the southern edge of Montgomery County, "extending from the northern brow of Chestnut Hill between the two turnpikes, across the Wissahickon Creek and the Schuylkill to a point about a mile west of Merion Square," occurs a long, straight outcrop of steatite and serpentine. The eastern and central part of this belt on its southern side "consists chiefly of a talcose steatite" while the northern side contains much serpentine interspersed in lumps through the steatite. Only in a few neighborhoods does the steatite or serpentine occur in a state of sufficient purity to be profitably quarried. On the east bank of the Schuylkill, about 2 miles below Spring Mill, a good quality of material occurs that has long been successfully worked. It has also been quarried on the west bank of the river about a third of a mile away, and to a less extent on the west bank of the Wissahickon, opposite Thorp's Mill. The material is now used principally for lining stoves, fire-places, and furnaces, though toward the end of the last century and the early part of the present one, before the introduction of Montgomery County marble, it was in considerable demand for door-steps and sills. It proved poorly adapted for this purpose, however, owing to the unequal hardness of its different constituents, the soap-stone wearing rapidly away, while the serpentine was left projecting like knots or "hob-nails in a plank."*

South Carolina.—Steatite or soap-stone is said to occur in this State in the counties of Chester, Spartanburgh, Union, Pickens, Oconee, Anderson, Abbeville, Kershaw, Fairfield, and Richland. The Anderson County stone is said to have been much used for hearthstones. That of Pickens County is considered of value, but it has been quarried to a very limited extent.†

The writer has seen some of this material. The national collections contain a single specimen of a very compact, nearly black steatitic rock marked as from Yorkville, in York County, but there are no data concerning its occurrence or utility.

Texas.—Soap-stone of good quality and inexhaustible in quantity is stated to occur in large veins on the Hondo and Sandy Creeks, about midway of their courses through Llano County.‡

Vermont.—Most of the steatite of this State is found on the east side of the Green Mountains and near the eastern line of the talcose slate formation, beds of it extending nearly the entire length of the State. The rock occurs usually associated with serpentine and hornblende. The beds are not continuous and have, as a rule, a great thickness in

* Rep. C⁴, Geol. Survey of Pa., pp. 95, 96.

† South Carolina, Population, Resources, etc., 1883.

‡ Second Ann. Rep. Geol. of Tex., 1876, p. 26.

comparison with their length. It not infrequently happens that several isolated outcrops occur on the same line of strata, sometimes several miles apart, and in many cases alternating with beds of dolomitic limestone that are scattered along with them.

At least sixty beds of this rock occur in the State in the towns of Readsboro, Marlborough, Newfane, Windham, Townsend, Athens, Grafton, Andover, Chester, Cavendish, Baltimore, Ludlow, Plymouth, Bridgewater, Thetford, Bethel, Rochester, Warren, Braintree, Waitsfield, Moretown, Duxbury, Waterbury, Bolton, Stow, Cambridge, Waterville, Berkshire, Eden, Lowell, Belvidere, Johnson, Enosburgh, Westfield, Richford, Troy, and Jay.

Of the beds named those in Grafton and Athens are stated to have been longest worked and to have produced the most stone. The beds lie in gneiss. The quarries were profitably worked as early as 1820. Another important bed is that in the town of Weathersfield. This, like that of Grafton, is situated in gneiss, but has no overlying rock, and the soap-stone occurs in inexhaustible quantities. It was first worked about 1847, and during 1859 about 800 tons of material were removed and sold. The Rochester beds were also of great importance, the stone being peculiarly fine-grained and compact. It was formerly much used in the manufacture of refrigerators. The quality of the stone is represented to be unusually good and free from impurities.* The bed at Newfane occurs in connection with serpentine, and is some half a mile in length by not less than 12 rods in width at its northern extremity. The soap-stone and serpentine are strangely mixed, and the general course of the bed being like that of an irregular vein of granite in limestone.

Virginia.—Soap-stone occurs in this State, according to Professor Rogers,† near the mouth of the Hardware River, both in Fluvanna and Buckingham Counties. There is also a bed of it associated with the talcose slates in Albemarle County, a little west of the Green Mountain. Specimens have been received from near this locality which were of excellent quality. The beds from here extend in a southwesterly direction, passing through Nelson County, where they are associated with serpentine; thence they cross the James River above Lynchburgh, and present an outcrop about 2 miles westward of the town on the road leading to Liberty; also one about 2½ miles westward of New London. Continuing in the same direction it is seen at the meadows of Goose Creek, where it has been quarried to some extent. Continuing in the same general direction the soap-stone again appears in several nearly parallel ranges, of which the most eastern makes its appearance near the Pigg River, in Franklin County. A second belt occurs in the same vicinity near the eastern base of Jack's Mountain; a third still farther west, about 1 mile from Franklin Court-House, and a fourth yet more to the west, on

* Geology of Vermont, Vol. II, p. 783–91.

† Geology of the Virginias, p. 79.

the eastern slope of Grassy Hill. The material from near Franklin Court-House is stated to be the best of any of the above. About 30 miles southwest from Richmond, at Chula, in Amelia County, there are outcrops of soap-stone said to be of fine quality, and which in former times were quite extensively operated by the Indians. They have been re-opened within a few years, and the material is now in the market. Specimens of the stone in the Museum collection are by no means pure talc, but carry abundant long brownish fibers of some amphibolic mineral.

B. SERPENTINE, OPHICALCITE, VERDANTIQUE MARBLE.

(1) COMPOSITION, ORIGIN, AND USES OF SERPENTINE.

Serpentine is essentially a hydrous silicate of magnesia, consisting when pure of nearly equal proportions of silica and magnesia with from 12 to 13 per cent. of water. The massive varieties quarried for architectural purposes are always more or less impure, containing frequently from 10 to 12 per cent. of iron protoxides, together with varying quantities of chrome iron (chromite), iron pyrites, hornblende, olivine, minerals of the pyroxene group, and the carbonates of lime and magnesia.

The origin of serpentine rocks has long been a matter of dispute among geologists. Recent investigations tend to show that in many cases they result unmistakably from the alteration of igneous eruptive rocks, especially the olivine bearing varieties, such as the peridotites and gabbros. In the varities ophicalcite, consisting of intermingled serpentine and calcite or dolomite, the serpentine is apparently in all cases derived by a procees of hydration and decalcification from a non-aluminous pyroxene. The theory long ably advocated by Dr. Hunt to the effect that the serpentine occurring intercalated with beds of schistose rocks and limestones resulted from metamorphism of silico-magnesian sediments deposited by sea waters is now very generally abandoned, and it is doubtful if the substance ever occurs as an original deposit even in the eozoonal forms, but is presumably always secondary.*

Serpentine is a soft, though somewhat tough, compact rock of variable color, usually greenish, though often variously streaked and spotted with yellow, yellowish green, brownish or more rarely red, its color depending, according to Delesse,† upon the degree of oxidation undergone by the included ferruginous mineral. The name serpentine is

* For further information on this point the reader is referred to such papers as T. G. Bonney on the serpentine and associated rocks of the Lizard District. Quar. Jour. Geol. Soc. of London, 1877, Vol. XXXIII, p. 11, p. 884, and on the serpentine and associated rocks of the Ayrshire coast, same journal, 1878, Vol. XXXIV, p. 769. Also T. S. Hunt on Geological History of Serpentine, Trans. Royal Soc. of Canada, Vol. I, Sec. IV, p. 169, and Wadsworth's Lithological Studies; also Williams on Serpentine of Syracuse, N. Y., Am. Jour. Sci., Aug. 1887.

† Zirkel, Petrography, Vol. I, p. 320.

from the Latin *Serpentinus*, a serpent, owing to its color and spotted appearance. Several varieties are recognized, the general name *Verdantique marble* being often applied indiscriminately to all, though the name (Verde Antico) was originally applied only to the various veined and brecciated serpentinous rocks, used by the Romans, and obtained from Italy, Greece, and Egypt. Ophite (from the Greek *Οφιτης*, like a serpent) is the name also often given to those varieties consisting of an intimate mixture of serpentine and calcite or dolomite. These rocks are also called ophiolite and ophicalcite by various writers.

Precious serpentine is the pure translucent massive varitey of a rich oil green color. Chrysotile and amianthus are the names applied to the fibrous silky variety, such as that from Canada, which is mined and utilized as asbestus.

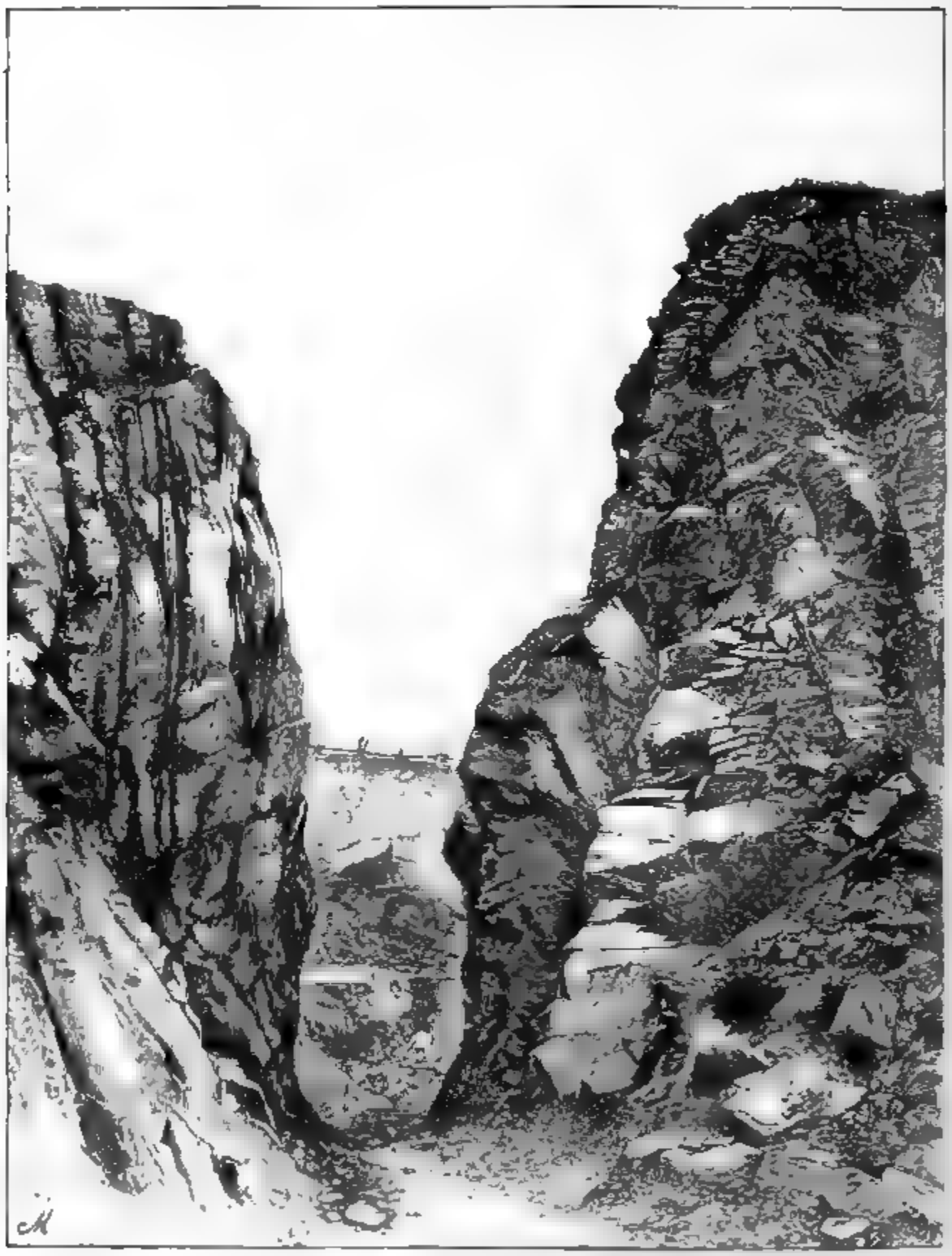
Owing to its softness, which is such that it can be readily carved or turned on a lathe and its beautiful colors when polished, serpentine has long been a favorite with all civilized nations for ornaments and interior decorative work. The rock, however, occurs almost universally in a badly jointed condition, so that blocks of small size only can be obtained, or if large, they are liable to break under pressure or even in process of dressing. (See illustration, Plate VI.) In the great majority of cases, moreover, the stone is unsuited for polished work that is to be exposed to the weather, since it shortly loses its gloss, wears unevenly, and becomes as unsightly as it was once beautiful. The Lizard (England) serpentine can be obtained, it is stated, in blocks 7 to 8 feet in length and from 2 to 3 feet in diameter, and it is being now much used in churches for ornamental fonts, pulpits, and small shafts and pilasters, as well as for vases and inlaid work.* According to Delesse† this stone takes a beautiful and lasting polish, as shown by certain tombstones in Westminster Abbey which were erected in 1710. The celebrated Verdi di Prato, from near Florence, Italy, although equally beautiful, however, is subject to rapid decay, and is hence entirely unsuited for exterior work. Serpentine for ornamental work is at the present time scarcely at all quarried in the United States, although inexhaustible quantities are found in many instances and of exceptionally fine quality. The following are the principal localities in the United States, nearly all of which are represented in some form in the national collection.

(2) SERPENTINES OF THE VARIOUS STATES AND TERRITORIES.

California.—Inexhaustible quantities of serpentine of a deep green or yellowish color occur in the region round about San Francisco, and often in such situations as to be easily available, as at the head of Market street. So far as observed none of the material is of such a quality as to render it of value for ornamental work, while its gloomy

*Hull, Building and Ornamental Stones, p. 102.

†Materiaux de Construction, p. 75.



SERPENTINE QUARRY, CHESTER, PENNSYLVANIA.

color renders it equally objectionable for purposes of general construction.

The rock is also abundant in other parts of the State, but the writer having seen none of the material, excepting as displayed in small fragments in the State museum at San Francisco, will refrain from further remarks on the subject.

Connecticut.—The serpentine deposits of Connecticut are thus described by Professor Shepard.* "Connecticut prospers, however, in the green marbles of Milford, a material for decoration much more beautiful and highly prized than white marble. These were first detected in 1811. Two quarries were soon after opened, one near the village of Milford, and called the Milford quarry; the other 2½ miles west of New Haven, and called the New Haven quarry. They were wrought with considerable activity for several years, and furnished an abundance of very rich marble; but as the working of them was attended with heavy expense from the difficulty of obtaining blocks of large dimensions that were perfectly sound, and from the labor required in sawing and polishing, they were in a few years abandoned, and have for a long time been in a neglected condition. The experiment proved an unfortunate one, therefore, not from any deficiency of marble or its lack of beauty—for these were both fully admitted—but from a want of wealth and taste in the country to sustain the price.

It was perhaps an unfortunate thing that the whole of the marble afforded by these quarries was denominated *verde antique*, whereas but a small part of that furnished is entitled to this name.

The quarry at Milford is capable of furnishing abundant supplies of this highly valued marble (*i. e.*, the verde antique variety), although, from the circumstance that it occupies narrow and irregular seams among the veined marble blocks or slabs of any size, it must always be dear compared with pieces sawn as formerly, without any regard to its separation from the more common kind. * * * Whenever the attempt to work it is made, it is to be hoped that the experience of the past will prevent its use for monuments exposed to the weather, for besides the incongruity of its colors compared with the marbles usually employed for this purpose, it soon loses its lustre and emits color from the action of the weather on the grains of magnetic iron ore it contains.

The New Haven marble, though destitute of the accidental and in some measure classical value which pertains to the Milford variety, is nevertheless a beautiful thing for decoration. In vivacity of colors and the delicacy of their arrangement it is hardly capable of being surpassed. It may be described as a bluish gray or dove-colored limestone clouded with greenish yellow serpentine, the latter containing black grains and sheet veins of magnetic iron ore. The disposition of the colors is cloud-like, flamed, and veined. It polishes with difficulty in

* Report on the geological survey of Connecticut, by C. U. Shepard, 1837, pp. 101–103.

consequence of the magnetic iron it contains, which, though it heightens its beauty, unfits it for exposure to the weather." So far as the present writer is aware these quarries have not been worked since the time mentioned by Professor Shepard; *i. e.*, since a few years subsequent to 1811.

Delaware.—Serpentine of various shades of green is stated to occur about 6 miles northeast from Wilmington, New Castle County, and also to the westward, near the State line, where Brandywine Creek enters the State line from Pennsylvania.* So far as the Curator is aware it has never been quarried.

Maine.—A large bed of serpentine occurs on the northern end of Deer Isle, in Penobscot Bay, in this State. The rock is very massive, and of a dark green, almost black color, sometimes streaked and spotted by veins of amianthus and diallage crystals. It is indeed almost too dark and somber for ornamental work, but seems well adapted for general building purposes and very durable. A company was formed some years ago for working this stone, and who erected a shop for saws and grinding beds. A considerable amount of material was quarried, but the work was soon discontinued, and had not been resumed at the time of the writer's visit in 1884. The company seem to have fallen into the error of supposing that the stone could be used in long pieces and slabs suitable for window trimmings, door-posts, etc., for which, owing to its jointed condition, it is entirely unfitted. The deposit covers a nearly level area of many acres in extent, and within a short distance of the shipping wharf.

Maryland.—In the vicinity of Broad Creek, in Harford County, in this State, occurs a very large deposit of serpentine, which is described by Professor Genth † substantially as follows:

"The outcrop of the first or upper bed of green serpentine, of about 500 feet in thickness, can be traced by its outcrop almost the whole distance between the upper ford on Broad Creek and over the hill in a northeasterly direction to a ravine on the same creek, a distance of about 1,800 feet; it also crosses the creek in a southwesterly direction, but it has not been ascertained how far it extends. The outcrop of the second bed was measured on the top of the hill between the horseshoe of Broad Creek, and found to be about 180 feet, and it is very conspicuous on the west side of the creek. Its full extent was not determined. The rock is a variety of massive serpentine somewhat resembling *williamsite*, and shows sometimes a slightly slaty structure. It occurs in various shades, from a pale leek green to a deep blackish green, and from a small admixture of magnetic iron, more or less clouded; rarely with thin veins of dolomite passing through the mass. It is translucent to semi-transparent, exceedingly tough, and its hardness is considerably

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*Geol. of Dela., 1841, p. 35.

†Geological Report of the Maryland "Verde Antique" marble, etc., in Harford County, Md., by Prof. F. A. Genth, 1875.

greater than that of marble." An analysis of the deep-green variety gave the following results:

	Per cent.		Per cent.
Silicic acid	40.06	Magnesia	39.02
Alumina	1.37	Water	12.10
Chromic oxide	0.20	Magnetic iron	3.02
Niccolous oxide	0.71		
Ferrous oxide	3.43		100.00
Manganous oxide	0.09		

Specific gravity 2.668, equal a weight of 166¾ pounds per cubic foot, or practically the same as granite. Specimens of this stone received at the National Museum admitted of a very high lustrous polish, the colors being quite uniformly green, slightly mottled with lighter and darker shades. It is not a true verde antique in the sense in which this name was originally employed. So far as can be judged from appearances, this is a most excellent stone, and admirably suited for interior decorative work.

About 6 miles north of the city of Baltimore, at a locality known as the Bare Hills, occurs an outcrop of a coarse light-green serpentine covering many acres. The rock is quite porous, of a dull light-green color, and unfitted for any kind of ornamental work, but admirably fitted for general building, especially in rock-faced and rubble work.

At the time of the writer's visit, in the summer of 1885, but a single quarry had been opened, and this was not at the time in operation. The material had been used with excellent effect in the construction of a school-house in the immediate vicinity. The stone occurs in the form of low rounded masses or bosses, and is regarded by Dr. G. H. Williams as an altered gabbro.* The supply is inexhaustible. Portions of the rock carry a very considerable amount of chrome iron, which was at one time mined here quite extensively. In the quarry the rock occurs in a very badly jointed condition, and the blocks are rounded and irregular. Firm blocks several feet in length can, however, be obtained, which cut up readily into sizes suitable for house walls and similar purposes.

The Museum has received from the farm of Mr. George W. Leakin, in this vicinity, samples of a fine dark-green rock, which took a fair polish, and perhaps might prove suitable for decorative work.

Massachusetts.—Serpentine exists in Massachusetts in great abundance, particularly in the Hoosac Mountain Range. "The most extensive bed occurs in Middlefield, in the southern part of the town. This bed can not be less than a quarter of a mile in breadth and 5 or 6 miles long. The colors of the rock are various and its hardness unequal. If wrought, it might supply the whole world. It yields both the precious and the common varieties. There is another bed in the same town, associated with steatite or soapstone. In the west part of Westfield is found another extensive bed of this rock, extending into Russell, of a much darker color, and containing green talc. This has been used in

* Bull. U. S. Geol. Survey, No. 28.

a few instances for ornamental architecture, and has a rich appearance when wrought.

Three beds of serpentine are found in Blanford and another in Pelham, in the southwest part of the town. The color of this last is dark, and the quantity of the talc is considerably large. A large bed occurs in connection with soapstone on the north side of Deerfield River, in Zoar, near the turnpike from Greenfield to Williamstown. Specimens from this place resemble those from the celebrated localities of this rock at Zoblitz, in Saxony." Two beds of serpentine exist also at Windsor, in this State.

"A locality of noble or precious serpentine has long been known to exist in Newbury, 2½ miles south of Newburyport, at an abandoned lime quarry called the "Devil's Den." Only small masses can be here obtained, but when polished they will compare with any in the world for beauty.*

Perhaps the most interesting and important bed of this rock that has as yet been found in the State is that at Lynnfield, in Essex County.† The bed has been traced from a point near the center of the town some 2 or 3 miles in a northeasterly direction. When first quarried the stone is said to be so soft that it can be cut with a handsaw and very readily turned on a lathe.

New Jersey.—A beautiful deep-green and oil yellow, often translucent serpentine, occurs, associated with dolomite, at Montville, in this State. Only pieces of small size are obtainable, and though of exceptional beauty the stone has never been utilized except for cabinet specimens.‡

New York.—At Moriah, in Essex County, in this State, there has been quarried from time to time under the name of ophite marble a peculiar granular stone consisting of an intimate mixture of serpentine and dolomite or calcite interspersed with small flecks of phlogopite. The rock varies from a finely granular granitic-appearing rock, consisting of about equal parts of serpentine and dolomite, to one in which the serpentine patches are some 2 or 3 inches or even a foot in diameter; The rock takes a good surface and polish, and by properly selecting the material and exercising judgment in cutting, these variations in texture can be made productive of very good effects.

This same stone is also found at Port Henry and Minerva, in the same county, and at Thurman, in Warren County.§

It is stated‖ that the largest and most valuable deposit of serpentine

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* Hitchcock's Geology of Massachusetts, Vol. 1, p. 158.

† Hitchcock's Geology of Massachusetts, p. 159.

‡ This serpentine has been recently shown to be derived from a non-aluminous pyroxene. Proc. Nat. Mus., 1888, p. 105.

§ Report of Judges, U. S. Cent. Ex., Vol. III, p. 158.

‖ Geology of New York, 1838, p. 205. The writer has recently shown that the Port Henry and Warren County ophiolites are altered pyroxenic limestones, Am. Jour. Sci., Mar., 1889.

in the State is found in the towns of Gouverneur, Fowler, and Edwards, in St. Lawrence County. The rock is said to be massive and sound, and remarkably free from the checks and flaws usually so profusely developed in rocks of this class. In Pitcairn, in the same county, there is also a fine deposit of serpentine of the variety commonly called precious. The calcareous spar is white or grayish-white, and forms a handsome background for the translucent serpentine. The quality of the rock is said to be excellent and free from natural flaws and fissures.

Serpentine also forms the main range of hills on Staten Island, and extends from New Brighton to a little west of Richmond, a distance of 8 miles. The rock assumes a variety of colors, from almost black to nearly white.

North Carolina.—The massive varieties of serpentine are found in many localities. The best appears to come from the neighborhood of Patterson, Caldwell County. It has a dark, greenish-black color, and contains fine veins of the yellowish-green fibrous and silky chrysotile, and admits of a fine polish; greenish-gray massive serpentine, also with seams of greenish and grayish white chrysotile is found at the Baker mine in Caldwell County, at which place are also found the varieties *marmolite* and *picrolite;* this last also occurs abundantly in the Buck Creek corundum mine, Clay County. Dark green serpentine has been observed in the neighborhood of Asheville, in Buncombe County, in Forsythe and Wake Counties. A grayish or yellowish green serpentine occurs in Caldwell, Wilkes, Surry, Yancey, Stokes, Orange, and Wake Counties, in the chrysolite beds of Macon, Jackson, Yancey, Mitchell, Watauga, Burke, and other counties. It results from the decomposition of the chrysolite.*

The writer has seen but a single sample of these rocks, and hence can express no opinion regarding their value.

Pennsylvania.—Serpentine, suitable for general building purposes, occurs in large quantities in the extreme southwestern portion of Chester County, near the Maryland line. There is also another large tract in the eastern part of the county and several smaller ones in the southeastern part, intervening between the two already mentioned. Quite similar tracts occur in the central part of Delaware County to the east of Chester, in the extreme southern portion of Lancaster County on the west, and in the southeastern part of Montgomery County, one of the largest of which is passed through by the Philadelphia and Reading Railroad near Mechanicsville. These serpentines are nearly altogether of a porous nature, light grayish-green in color and eminently adapted for purposes of general construction. As a rule they acquire a very dull and poor polish and are unfitted for the finer grades of ornamental work. In every particular they correspond closely with the serpentine of the Bare Hills, Maryland, already described. The quarries at the present time most extensively worked are located on what are known as

*Geology of North Carolina, 1881, p. 57.

the Chester Barrens, near the town of West Chester. Quarries were first opened here in 1790, and up to date upward of 500,000 cubic yards of material have been taken out. The rock, as usual, occurs only in a jointed condition, and blocks of large size can not be obtained; the largest yet quarried measured 3 feet square by 16 feet in length.

The principal markets for the quarried material are New York, Philadelphia, Baltimore, Washington, and Chicago, though it has been used in Philadelphia to a greater extent than elsewhere. The University of Pennsylvania, Academy of Natural Sciences, and about twenty churches in this city are of serpentine.

Quarries that have been worked in years past occur near the Maryland line (Rising Sun post-office), and in Media, Delaware County. The price of the rough stone at the quarries varies from 20 to 40 cents per cubic foot, and the cost of dressing varies from 5 to 15 cents per square foot of surface.* A beautiful deep lustrous green variety susceptible of a high polish and known as *Williamsite* was found in abundant small pieces during the working of the Fulton township chromite mines. Excepting as polished specimens for mineral cabinets the material was never utilized.

Although the Chester County stone has been upon the general market only about ten years it has already acquired an excellent reputation. To the writer it seems, however, that in the majority of cases very poor taste has been shown on the part of the designers, very many of the buildings being anything but beautiful from an architectural stand-point. The almost universal practice of using a light, yellowish-gray sandstone for the trimmings in houses of this material should also be condemned, since the contrast is not sufficient nor satisfactory.

The use of the stone in cities has not been long enough continued to furnish accurate data regarding its durability there, but it is stated that houses erected in the vicinity of the quarries one hundred and fifty years ago show the color of the stone to-day as fresh as when first quarried. The writer's personal observations are, however, to the effect that in a majority of cases many of the blocks exposed in a wall turn whitish, or at least fade to a lighter green. Such a change can scarcely be considered detrimental.

Vermont.—The bed of talcose slate that extends in a general northern and southern direction throughout the entire length of central Vermont bears numerous outcrops of serpentine or of serpentine in combination with dolomite, but which, so far as the writer is aware, have been quarried in but two localities, Roxbury and Cavendish. The quarry at Cavendish was worked very early, having been opened about 1835,† before there were adequate means of transportation of the quarried stone or there was any sufficient demand for so expensive a material. The

* See Geology of Chester County, Vol. C⁴, Second Geological Survey of Pennsylvania, p. 61, *et al.*

† Geology of Vermont, Vol. II, p. 778–9.

methods of working and polishing the stone were, moreover, so little understood that very poor results were obtained and the works were shortly discontinued as a consequence.

In Roxbury the American Verd-antique Marble Company early opened quarries and erected a mill for sawing. The business was pushed quite vigorously for a time, but owing to several causes, probably the same as the first enumerated, the works were shut down in 1858, and have not since been re-opened. A considerable quantity of the material was taken out for the interior decorations of the United States Capitol extensions, but for some reason, unknown to the writer, it was never used.

The Vermont stones are among the most beautiful of all our serpentines and the best adapted for all kinds of interior decorative work. The colors are deep, bright green, traversed by a coarse net-work of white veins. It is designated by Hunt* an ophiolite, and is stated by him to be a mixture of serpentine, talc, and ferriferous carbonate of magnesia. It acquires a smooth surface and beautiful polish, and it is a serious comment upon American taste that there is not sufficient demand for the material to cause the quarries to be re-opened. At Cavendish the railroad now passes within one-half mile of the quarry and good water-power is close at hand, while the Roxbury quarry is within 30 rods of the railway station. The rock lacks the brecciated structure characteristic of most foreign verd-antique, but compares more closely with the variety known as Verde di Genova than with any other with which the author is acquainted. Among the other localities in this State in which serpentine occurs may be mentioned Richford, Montgomery, Jay, Troy, Lowell, Middlesex, Wailsfield, Warren, Rochester, Ludlow, Windham, Wadsborough, and Dover.

Of the Lowell stone it is stated† that two ranges of serpentine occur, commencing near the headwaters of the Missiseo and extending nearly to Canada. "For the richness and number of the varieties it would not seem possible that they can be surpassed, while their extent, amounting to 20 or 30 square miles, is beyond the possible demand of all future ages. They are exhibited in several precipitous ledges, which are easy of access and of being worked."

Concerning the locality at Troy, the same authority states: "Elegant varieties are numerous, among which are most conspicuous the very bright green noble serpentine, which covers most of the numerous jointed faces with a coat of one-eighth to one-half of an inch thick, and the spotted varieties. Numerous seams may render it difficult to obtain large slabs, but smaller pieces, suitable for a great variety of ornamental purposes, may be obtained, of great beauty and in any quantity."

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* T. S. Hunt, on Ophiolites, Am. Jour. of Sci., Vol. xxv, p. 239; second series, p. 226.

† Geology of Vermont, 1861, Vol. I, p. 544.

C.—GYPSUM. ALABASTER.

This can scarcely be considered a building-stone, and it is used only to a small extent for ornamental purposes. We may, however, devote a little space to the subject.

(1) COMPOSITION AND USES OF GYPSUM.

Pure gypsum is composed of the sulphate of lime and water in the proportions of about 79.1 per cent. of the former to 20.9 per cent. of the latter (ante, p. 370). Three varieties are common: (1) crystallized gypsum or selenite, which occurs in broad, flat, transparent plates sometimes a yard in diameter and of value only as mineral specimens and for optical purposes; (2) fibrous gypsum, which includes the variety satin spar used for making small ornaments; and (3) massive gypsum, which includes the common white and clouded varieties used in making plaster, and the pure, white, fine-grained variety alabaster.*

(2) LOCALITIES OF GYPSUM IN THE UNITED STATES.

The principal localities of gypsum in the United States as given by Danat are in New York, Ohio, Illinois, Iowa, Virginia, Tennessee, and Arkansas, where it occurs in extensive beds and usually associated with salt springs. It is also found associated with Triassic deposits in the Rocky Mountain region. Handsome selenite and snowy gypsum are also stated to occur near Lockport and Camillus, N. Y., in Davidson County, Tenn, and in the form of rosettes in the Mammoth Cave of Kentucky.

According to G. F. Kunz‡ the ornaments of satin spar sold at Niagara Falls and other "tourist places" are nearly all imported from Wales, though some few of the common white variety are cut from the beds of this stone found in the vicinity. The Italian alabaster is used extensively in making statuettes (see p. 473), but the common varieties found in this country and Nova Scotia are used chiefly for land plaster and as plaster of paris, or stucco. So far as the Curator is aware the gypsum quarried at Fort Dodge, Iowa, is the only one that has been at all used for structural purposes in this country.

According to Dr. White§ several residences, a railway station, and other minor structures, including a large culvert, have been built of gypsum at this place. In the construction of the culvert the lower courses that came in contact with the water were of limestone, as the gypsum had proven slightly soluble and hence less durable in such positions. The stone is regarded by Dr. White as very durable in ordi-

* Much of the material popularly called alabaster is in reality travertine (see p. 375.)

† Text book of Mineralogy, p. 393.

‡ Min. Resources of the United States, 1883–'84, p. 77.

§ Geol. of Iowa, Vol. II, p. 302.

nary situations, and the ease with which it can be worked renders it preferable to the limestones in the immediate vicinity. The method of quarrying is to bore holes with a common auger and then blast by means of powder. The blocks are then trimmed to the proper size and shape by means of common wood-saws and hatchets or axes.

D.—LIMESTONES AND DOLOMITES.

(1) CHEMICAL COMPOSITION AND ORIGIN.

Pure limestone consists entirely of calcium carbonate. In point of fact, however, none of our limestones are chemically pure, but all contain more or less foreign materials, such as magnesia, oxides of iron, silica, clay, bituminous matter, mica, talc, and other minerals.

In composition, texture, and general appearance, limestones vary almost indefinitely. They may be hard, compact, fine-grained rocks of almost flint-like texture, or, again, coarsely porous, oolitic, or crystalline, the crystals varying in size from too small to be visible to the naked eye to an inch or more in length.

Pure limestone is white in color, but water blue, gray, green, pink, red, and black varieties are common, the colors being dependent upon various impurities, such as the oxides of iron and carbonaceous matter caused by animal and plant remains. The pink and red colors are caused by iron oxides, while the blue, gray, and black varieties owe their hues to the prevailing carbonaceous matter. The green color of some of the Vermont marbles appears to be due to talc.

Limestones are regarded by geologists as of either chemical origin or as resulting from the deposition of organic remains, such as shells and corals. Of the first kind are the tufas and travertines; of the second, the fossiliferous limestones, such as the encrinital stones of Ohio and the shell marbles of Tennessee. Either variety may have undergone the change called metamorphism, and all traces of their origin have been destroyed.

Limestones occur in stratified beds among rocks of all geological ages, from the Archæan to the most recent. The majority of those used for building and ornamental work belong either to the Cambrian, Silurian, Devonian, or Carboniferous ages.

(2) VARIETIES OF LIMESTONES AND DOLOMITES.

The following list includes all the principal varieties of limestone popularly recognized, the distinctions being founded upon their structure, chemical composition, and mode of origin:

Crystalline limestone. Marble.—An entirely crystalline, granular aggregate of calcite crystals. The crystals are usually of quite uniform size in the same marble, but often vary widely in those from different lo-

calities. The fine-grained white varieties which appear like loaf sugar are called *saccharoidal.* Common statuary marble is a good example of this variety.

Compact common limestone.—A fine-grained crystalline aggregate which to the eye often appears quite homogeneous and amorphous. It is rarely pure, but contains admixtures of other minerals, giving rise to many varieties, to which particular names are given. *Lithographic limestone* is an extremely fine-grained crystalline rock, with but a small amount of impurities, and of a drab or yellowish hue. *Bituminous limestone* contains a considerable proportion of bitumen, caused by decomposing animal or vegetable matter. Its presence is easily recognized by the odor of petroleum given off when the rock is freshly broken. *Hydraulic limestone* contains 10 per cent. and upwards of silica and usually some alumina. When burnt into lime and made into mortar or cement it has the property of setting under water. *Oolitic limestones* are made up of small rounded concretionary grains that have become cemented together to form a solid rock. These little rounded grains resemble the roe of a fish; hence the name, from the Greek word *ωὸν,* an egg. Where the grains are nearly the size of a pea the rock is called *pisolite.* Such a rock is now in process of formation along the shore of Pyramid Lake, Nevada. Oolitic limestones suitable for building purposes are quite abundant in Iowa, Indiana, and Kentucky.

Travertine, or *Calc Sinter,* is limestone deposited by running streams and springs. It occurs in all gradations of texture from light flaky to a compact rock fit for building. A light, porous calc sinter has been deposited by the Mammoth Hot Springs of Yellowstone National Park, some of which is nearly pure carbonate of lime and snowy white in color. Travertine occurs in great abundance at Tivoli, in Italy, from whence it was quarried in building ancient Rome. The exterior of the Amphitheatrum Flavium, or Colosseum, the largest theater the world has ever known, was of this stone, as was also the more modern structure of St. Peter's, in the same city.* The Latin name of the stone was *lapis Tiburtinus,* of which the word "travertine" is supposed to be a corruption.

So far as is known the beds of this country are of limited extent and, with one or two exceptions, unfit for any kind of structural purpose. The pearly white and red "onyx" marble from San Luis Obispo and Suisun City, Cal., are properly travertine; so are also the celebrated "Mexican onyx" and so-called "Oriental alabaster" from Egypt.

Stalactite and *stalagmite* are the names given to the deposits of limestone on the roofs and floors of caves. Such are often beautifully crystalline and colored by metallic oxides, giving rise to beautiful marbles, which are incorrectly called onyx, as are also the travertines, from which they differ only in method of deposition.

* Hull, Building and Ornamental Stones, pp. 279, 281.

LIMESTONES COMPOSED LARGELY OF ORGANIC REMAINS.

Fossiliferous limestones.—Many limestones are made up wholly or in part of the fossil remains of marine animals, as is shown in the accompanying figure, which is drawn from a magnified section of a limestone of the Cincinnati group from near Hamilton, Ohio.

In some cases the remains are retained nearly perfect; again the entire fossil may have been replaced by crystalline calcite. In other instances stones are found which are made up only of casts of shells, the original shell material having decayed and disappeared, as in the Eocene limestone from North Carolina. Many of the most beautiful marbles belong to the group of fossil limestones, as, for instance, the red and white variegated Tennessee marbles. *Crinoidal limestones* are made up of fossil crinoidal fragments.

Shell limestones or *shell sand-rocks* as they are called by some authorities, are made up of shells usually much broken, though sometimes almost entire. The well-known *coquina* from Saint Augustine, Fla., is a good illustration of this variety. *Coral rock* is of the same nature, excepting that it is composed of fragments of corals. *Chalk* is a fine white limestone composed mainly of the minute shells of foraminifera.

MAGNESIAN LIMESTONES; ALSO CALLED DOLOMITIC LIMESTONES.

Under this head are included those limestones which contain 10 per cent. and upwards of carbonate of magnesia. They may be finely or coarsely crystalline; light, porous, or compact; fossiliferous or non-

fossiliferous; in short, may show all the variations common to ordinary limestones, from which they can usually be distinguished only by chemical tests. Many marbles are magnesian, as will be noticed by reference to the tables. When the carbonate of magnesia in a limestone rises as high as 45.65 per cent. the rock is no longer called magnesian limestone, but—

DOLOMITE. *

This in its typical form is a crystalline granular aggregate of the mineral dolomite, and is usually whitish or yellowish in color. It can in its typical form be distinguished from limestone by its increased hardness (3.5–4.5) and specific gravity (2.8–2.95). It is also less soluble, being scarcely at all acted on by dilute hydrochloric acid. Dolomite shows all the peculiarities pertaining to limestones, both in color and texture, and a chemical analysis is often required to distinguish between them. The pure white marble from Cockeysville, Md., is a dolomite, but by the eye alone can not be distinguished from the white crystalline limestones (marbles) of Vermont. The red-mottled marbles of Malletts Bay, Vt., are also dolomites, as are the white marbles of Lee, Mass., and Pleasantville, N. Y.

In composition there is no essential difference between a limestone or dolomite and what is popularly called a marble, but for convenience sake the subject will be here treated in two parts, the first to include those of this class of rocks as are put upon the market as marbles, and the second the rocks of the same composition but unfit for finer grades of building and ornamental work and known popularly as simply limestones.

(3) LIMESTONES AND DOLOMITES. MARBLES.

Under the head of marbles then are here included all those rocks consisting essentially of carbonate of lime (limestone) or carbonate of lime and magnesia (magnesian limestone and dolomite) that are susceptible of receiving a good polish and are suitable for ornamental work.

Alabama.—Beds of marble of great beauty are stated to occur along the Cahawba River in Shelby County of this State. The colors enumerated are gray with red veins, red and yellow, buff with fossils, white crystalline, clouded with red and black. A black variety veined with white occurs on the road from Pralls Ferry to Montevallo and on Six Mile Creek. Other good beds are stated to occur on the Huntsville road about 19 miles from Tuscaloosa and at Jonesborough, the latter rock being compact and of a red and white color; the same strata occurs at Village Springs. On Big Sandy Creek good marbles occur similar to those on the Cahawba.† None of the above are actively quarried, and the writer has had the opportunity of examining but a single

* So called after the French geologist, Dolomieu.

† Geol. of Alabama, First Dien. Rep., 1849, p. 45.

specimen; that a small block of fine and even texture, pure white color and excellent quality, said to be from near Talladega.

Arkansas.—Black and variously colored marbles mottled with white fossil shells and crinoids are stated by Owen * to occur in Independence, Van Buren, Searcy, Carroll, and Marion Counties. The author has seen none of the material and has no more definite information on the subject than that given above.

California.—Owing to the violent geological agencies that have been in operation since the formation of the marble deposits in this State, the stones found are said to be so broken and shattered in nearly every case that it is impossible to obtain pieces of large size free from cracks and flaws.† Near Indian Diggings, in Eldorado County, there occurs a fine-grained white, blue-veined marble that closely resembles the Italian "bardiglio," from the Miseglia quarries, but that the groundmass is lighter in color. It has been used only for grave-stones and to but a slight extent at that. In Kern County are deposits of marbles of various shades, but all so broken and shattered as to be very difficult to work. Near Colfax, in Placer County, are also beds of a dark blue-gray mottled magnesian limestone that takes a good polish and might be utilized as marble. Other deposits occur in Los Angeles, Monterey, Nevada, and Plumas Counties, but none of them are at present worked. The most beautiful of all the California marbles is the massive aragonite, or so-called "onyx," from San Luis Obispo. This stone, which is, as I understand, a travertine, is identical in composition and structure with the celebrated Oriental alabaster (wrongly so-called) from Blad Recam, near the ravine of Oned Abdallah. In color it is pearly white, and it is made up of fine, wavy parallel bands like the lines of growth upon the trunk of a tree. This stone is now being quite extensively introduced for small stands and ornamental work, which are often of exquisite beauty. No other travertines that can compare with this are at present quarried in the United States, though a beautiful variety is found in extensive deposits at Tecali, State of Puebla, Mexico.

Another travertine marble occurs in very limited amounts near the town of Suisun, Solano County. The quarry lies in a low hill near the town, and has been quite extensively worked, but no large pieces of even texture are obtainable, which is of course a drawback to its extensive use.‡

Specimens of this stone received at the National Museum are of a dull red or amber-yellow color, resinous luster and somewhat porous. A far more beautiful stone, but which also occurs in very limited amounts, is found near the falls of the Sacramento River in Siskiyou County. This is also aragonite and is of a beautiful emerald-green color. The color is however so delicate that pieces of considerable thickness (an

* Geol. of Arkansas, First Annual Report.

† Rep. Tenth Census, p. 279.

‡ Rep. State Mineralogist of Cal., 1884, p. 73.

inch or more) must be used in order to appear to advantage. The stone is found, as I am informed by Mr. J. S. Diller, of the U. S. Geological Survey, in a narrow seam in the gneissoid rocks of the region, and there is very little probability of its ever being obtainable in pieces of more than a foot or so in length.

Prof. H. G. Hanks, in a paper recently read before the San Francisco Microscopical Society, describes, under the name of "Inyo" marble, a pure white crystalline dolomite occurring in the White and other mountains of the Inyo range in this State. It is regarded by him as an excellent stone, and one promising of future usefulness. Besides this he mentions a yellow brecciated marble found at Tehachipi, in Kern County, and a black marble found near Colfax. The author has seen none of these stones.

Colorado.—No marbles are as yet quarried in this State, but the Museum collections show a small piece of a black white-veined breccia from Pitkin that might rival the imported "Portoro" from the Monte d'Arma quarries in Italy, if occurring in sufficient abundance. Concerning the extent and character of the formation the author knows nothing. In the marble yards of Denver the author was shown during the summer of 1886 a fine chocolate-colored stone, somewhat resembling the more uniform colors of Tennessee marble, which was stated to have been brought from near Fort Collins, in Laramie County, where it occurred in great quantities; also a fair grade of white blue-veined marble from Gunnison County. A beautiful breccia marble is stated* to occur in abundance a few miles north of Boulder City.

Connecticut.—In the northern part of Litchfield County, near the Massachusetts line, in the town of Canaan, East Canaan, and Falls Village, there occur massive beds of a coarsely crystalline white dolomite, which have in years past furnished valuable building marbles, though recently they have been but little worked. The stone is said to weather well and to be obtainable in large blocks eminently suited for building, but like the Lee dolomite it frequently contains crystals of white tremolite, which weather out on exposure. It is therefore not so well suited for finely finished or monumental work. The State-House at Hartford is the most important structure yet made from this material.

As already noted (ante, p. 288), it was at Marble Dale, in the town of Milford, in this State that marble quarrying was first systematically undertaken in this country, and at one time (1830) not less than fifteen quarries were in active operation in the vicinity. So far as can be learned not a single one of these is now being worked.

Delaware.—No marbles are at present quarried in this State, but a coarse white dolomite is found near Hockessin, New Castle County. This, so far as can be judged from the single specimen examined, might be used for general building, though not well suited for ornamental work.

* Bien. Rep. State Geol. of Colo., 1880, p. 33.

Georgia.—An important belt of marble is said to extend through the counties of Cherokee, Pickens, Gilmer, and Fannin in the northern part of this State, the material varying in color from pure white through blue and variegated varieties, some of which are remarkably beautiful. Variegated marbles also occur in the counties of Polk, Floyd, Whitfield, Catoosa, Chattooga, Gordon, Murray, Barton, and Walker; chocolate-red varieties similar to the marbles of Tennessee are said to occur in abundance in Whitfield County, the bed in Red Clay Valley extending in uninterrupted continuity for 10 miles, and varying from one-fourth to one-half a mile in width.* Of the beds above mentioned those in Pickens County are at present the most important and the only ones that have been worked to any extent, quarrying having quite recently been commenced here by the Perseverance and Georgia Marble Companies. Specimens of these marbles forwarded to the National Museum show them to be of uniform texture, but coarse, much coarser than the Vermont marble, which in other respects they much resemble. They are soft, work readily, and acquire an excellent surface and polish. In color they vary from snow white and pink to black and white mottled. The pink variety is unique as well as beautiful, and there is at present nothing like it produced in other parts of the country, though in color it closely resembles the pink marble from Cherokee and Macon Counties, N. C., to be noticed later. It is, however, coarser.

The ready working qualities of these stones, the fact that owing to the mildness of the climate the works can be in operation at all seasons of the year, together with the remoteness of regions where similar marbles are produced, all point to a rapid development of an extensive quarrying industry in this part of the country.

Iowa.—The calcareous rocks of Iowa are, as a rule, non-crystalline, dull in color, and with few qualities that render them desirable for ornamental purposes. But few of them are pure limestone, but nearly all contain more or less magnesia, iron, or clayey matter; very many of them being true dolomites.

Near Charles City, in Floyd County, on the banks of Cedar River, are extensive quarries in the Devonian (Hamilton) beds of magnesian limestones, certain strata of which furnish a coral marble at once unique and beautiful. The prevailing color of the stone is light drab, but the abundant fossils vary from yellowish to deep mahogany brown. These last, which belong to the class of corals called Stomatophora, are very abundant and of all sizes up to 18 inches in diameter. As seen on a polished surface imbedded in the fine, drab, non-crystalline paste of the groundmass, they present an appearance totally unlike anything quarried elsewhere in America—an appearance at once grotesque and wonderfully beautiful. The stone admits of a high polish, and would seem excellently adapted for all manner of interior decorations if obtainable in blocks sufficiently uniform in texture. A small amount of argilla-

* Commonwealth of Georgia, p. 135.

ceous matter and scattering particles of amorphous pyrite, which are occasionally visible, render its adaptability to outdoor work decidedly doubtful. The stone is known commercially as "Madrepore marble." A polished slab 2 by 4 feet is in the collections of the National Museum.

The light yellowish, buff, or brown sub-Carboniferous magnesian limestone, quarried near Le Grand in Marshall County, also contains massive layers beautifully veined with iron oxide, and which are suitable for ornamental purposes, though it is not considered suitable for monuments and other work subject to continuous exposure. I have not seen samples of this material, though it is well spoken of by White.* It is popularly known as "Iowa marble." The only other stone which, so far as I am aware, has ever been utilized for ornamental purposes is the so-called "Iowa City," or "Bird's-eye marble." This is nothing more than fossil coral "(Acervularia Davidsoni) imbedded in the common Devonian limestone and often perfectly consolidated by carbonate of lime so that it may be polished like ordinary marble. When so polished its appearance is very beautiful, for the whole internal structure of the coral is as well shown as it is in living specimens, and yet it is hard and compact as real marble." The stone would be valuable could it be obtained in blocks of large size. Unfortunately it occurs in pieces of but a few pounds' weight;† it is used therefore only for paper-weights, and small ornaments of various kinds.

Maryland.—The principal marble quarries of this State are located near Cockeysville and Texas, some 16 miles north of Baltimore, on the Northern Central Railroad. Here there occurs a small and isolated area of Lower Silurian (?) dolomite of medium texture and pure white color that has been very extensively used for general building purposes in Baltimore and Washington and the neighboring towns, and to a less extent in Philadelphia. In the quarries the stone lies in large horizontal masses, and blocks 28 by 10 by 3 feet have been quarried entire. This stone was used in the construction of Christ Church in Baltimore, the Washington Monument, and the columns and heavy platforms of the Capitol extensions at Washington, D. C.

Near Union Bridge, in Frederick County, there occurs a fine-grained and compact white magnesian limestone, but which has not been quarried to any extent.

The only true conglomerate or breccia marble that has ever been utilized to any extent in the United States is found near Point of Rocks, Frederick County, in this State. The rock, which belongs geologically to the Triassic formations, is composed of rounded and angular fragments of all sizes, up to several inches in diameter, of quartz and magnesian limestone imbedded in a fine gray calcareous groundmass. This composition renders the proper dressing of the stone a matter of some difficulty, since the hard quartz pebble break away from the softer parts in which they lie, leaving numerous cavities to be filled with colored wax

* Geol. of Iowa, vol. 2, p. 313. † White, *op. cit.*, p. 316.

or shellac. It should therefore never be worked with hammer and chisel, but only with saw and grinding material, and no attempt made at other than plain surfaces. The stone was used for the pillars in the old Hall of Representatives in the Capitol at Washington, and a polished slab, 34 inches long by 20 inches wide, may be seen in the National Museum. The pebbles forming the stone are of so varied shades that to state its exact color is a matter of difficulty. Red, white, and slate-gray are perhaps the prevailing tints. On account of its locality this stone has been popularly called "Potomac" marble, or sometimes "calico" marble, in reference to its structure and spotted appearance. The formation from whence it is derived is said to commence near the mouth of the Monocacy River and to extend along the Potomac to Point of Rocks, and along the valley on the eastern side of the Catoctin Mountain to within 2 miles of Frederick. The Curator is informed, moreover, that the same formation occurs in Virginia, near Leesburgh, and that here the quartzose pebbles are almost entirely lacking, thereby rendering the stone much less difficult to work.

Massachusetts.—Crystalline limestones and dolomites of such a character as to assume the name of marble are now or have been in times past quarried in various towns of Berkshire County, in this State. The stones are all white or some shade of gray color, medium fine-grained in texture, and are better adapted for general building than for any form of ornamental work.

The quarries at Lee were opened in 1852, and the stone has been used in the Capitol extension at Washington and the new city buildings in Philadelphia; but little of it has been used for monuments. In the quarries the stone lies very massive, and it is stated cubes 20 feet in diameter could be obtained if necessary. The Sheffield quarries were opened about 1838. The rock here is massive, with but little jointing. Natural blocks 40 feet square and 3 feet in thickness can be obtained. The Alford stone is used mostly for monumental work and appears very durable. Much of the marble from these localities contains small crystals of white tremolite which weather out on exposure, leaving the rock with a rough pitted surface. This is very noticeable in the exterior walls of the Capitol building at Washington, already noted.

Missouri.—We have seen but few true marbles from this State, though colored marbles of fine quality equaling the variegated varieties of Tennessee are reported by Professor Broadhead as occurring in Iron, Madison, and Cape Girardeau Counties. The Iron County stone is reported as light drab in color, with buff veins. The outcrop occupies an exposure of several hundred feet of a low bluff on Marble Creek near the east line adjoining Madison County. The Madison County marble occurs near Fredericktown, and is described as the best-appearing marble in the State both in regard to color and texture, the colors being red, peach-blossom, and greenish, beautifully blended. The stone is represented as very durable, but liable to tarnish on a polished surface

when exposed to the weather. The Cape Girardeau stone is represented as of a variety of colors—purple, yellow, red, pink, gray, and greenish all being enumerated; the supply is unlimited. None of these marbles are at present systematically worked, owing to lack of capital and distance from market. Professor Broadhead further states that few of the marble beds of southeastern Missouri are thick enough to be economically worked, as there would be too large a portion of waste material.

No pure white crystalline marbles are as yet known to occur within the State limits. Other stones capable of receiving a polish and suitable for marble are stated to occur in the counties of Saint Louis, Saint Charles, Warren, Montgomery, Ralls, Calloway, Lincoln, Cooper, Pettis, Cass, Jackson, Livingston, and Clay.

Montana Territory.—This Territory as yet quarries no marble or other stone of importance. There were exhibited, however, at the Centennial, in Philadelphia, 1876, and since then in the National Museum at Washington, two samples from Lewis and Clarke County that are worthy of note, since they form the nearest approach to the imported Italian black and gold marble from the Spezzia quarries of any at present found in America. The rock is very close and compact, of a dark blue-gray color, and traversed by irregular wavy bands of varying width of a dull chrome-yellow color. So far as observed the stone is far inferior in point of beauty to its Italian prototype, and apparently would prove more difficult to work.

New York.—The belts of Archaean dolomite which lie to the north of New York City and cross the State in a northeasterly direction furnish a very fair quality of white and gray marbles that have at various times been quite extensively utilized. At present the quarries at Tuckahoe and Pleasantville, in Westchester County, furnish marble of good quality but of rather coarse texture. That from Pleasantville is particularly remarkable in this respect, being made up of large snow-white crystals, often an inch or more in length, whence it derives its popular name of snowflake marble. On account of its coarseness it is not well adapted for carved work or for use in long columns. The Tuckahoe stone is not quite so coarse in texture and has been more extensively employed for building purposes. St. Patrick's Cathedral, on Fifth avenue, New York City, is of this stone. At Sing Sing and Dover Plains are other quarries of rather coarse white dolomitic marble, but which are not extensively worked.

A very coarsely crystalline light-gray magnesian limestone of Archaean age occurs at Gouverneur, in Lewis County. Although too coarse for carved work it answers well for massive structures, and, as it acquires a good surface and polish, is used to some extent for ornamental work. It is believed to be durable, since gravestones in the vicinity which have been set upwards of seventy years still present clean and uniform surfaces, and are free from lichens and discolorations of any kind.

Two excellent varieties of colored marbles occur at Plattsburgh and Chazy, in Clinton County, in this State, and which are commercially known as "Lepanto"* and French gray. The first consists of a close, fine-grained gray groundmass with pink and white fossil remains, which are evidently crinoidal. The second is more uniformly gray and bears larger fossils. It is an excellent stone and, with perhaps the exception of the Tennessee marbles, has been used more extensively for mantels, table tops, tiling, and general interior decorative work than any other of our marbles.

At Glens Falls, on the Hudson River, occurs an extensive deposit of dark blue-black magnesian limestone, certain strata of which furnish the finest varieties of black marble at present quarried in this country. The stone is very fine grained and compact, and, when polished, of a deep, lustrous black color, though the uniformity of the surface is sometimes broken by the presence of a small white fossil. A two-foot cube of this stone is in the Museum collections. The finest quality of this marble occurs in a single stratum some 12 feet in thickness. The poorer qualities are burned for lime, of which they furnish material of exceptional purity. Black marble is also quarried to some extent at Willsborough, in Essex County. At Port Henry, in this same county, there is quarried a green and white speckled marble, composed of an intimate mixture of serpentine, calcite, and dolomite that has been used for interior decorative work. This stone has been noticed more fully under the head of serpentine.

At Lockport there is extensively quarried a soft gray crinoidal limestone in which the fossils are frequently of a pink or bluish opalescent color. It is used to some extent for mantels and other ornamental purposes.†

In the town of Warwick, in Orange County, there is found a beautiful, coarsely crystalline marble of a carmine-red color, sometimes slightly mottled or veined with white. But little of it has been used and the supply is reported as small.

North Carolina.—Although no quarries of marble are at the present time worked to any extent in this State, there occur within its limits numerous deposits of most excellent material that only require enterprise and capital to bring to a ready market. One of the most important of these is near Red Marble Gap, in Macon County. The rock is a beautiful bright flesh pink, sometimes blotched or striped with blue and yellow. The texture is fine and even, and it acquires an excellent surface and polish. The stone is stated by Professor Kerr to occur in the side of the mountain in cliffs 150 feet or more in height, and blocks of almost any size can be obtained. It is quite different from any-

* The Lepanto marble is figured on Pl. XXXII of the census report, where it is wrongly set down as from Isle La Motte, Vermont.

† J. S. Newberry in report on building and ornamental stones, Vol. III Inter. Ex. Reports, p. 158.

thing now in the market, and would doubtless find a ready sale if once introduced. Other marbles of white or blue-gray color occur in Murphy, and Valley Town, Cherokee County; Warren Springs, Madison County, and near Marion, in McDowell County. Lack of transportation facilities at present is a serious drawback to the introduction of any of these into our principal markets. We have also seen small pieces of very compact deep blue-black crystalline limestone, taking a high polish and suitable for the finest grades of ornamental work, from near Nantehala, Swain County, in this State. Portions of the stone are traversed by a coarse network of pure white calcite veins that greatly added to its beauty.

Pennsylvania.—The belt of Lower Silurian limestone that extends from Sadsbury and Bart Townships, in Lancaster County, in a general easterly direction through Chester County, and through the western half of Montgomery County, includes within its area the only quarries of merchantable marble at present worked within the State limits. According to Professor Rogers* this belt forms the bed of a narrow valley some 58 miles in total length, extending from near Abington, in Montgomery County, to the source of Big Beaver Creek, in Lancaster County. The prevailing colors of the stone throughout the larger portion of this area are yellowish or bluish, and it is, as a consequence, suitable only for making quicklime or for ordinary rough building purposes. On the southern side of the valley, however, between Brandywine and Wissahickon Creeks, the stone has become highly metamorphosed and converted into a crystalline granular marble, white or some shade of blue in color, though often variously veined or mottled. All the quarries as yet opened are situated in Montgomery County, on the steeply upturned or overturned edges of the outcrops within half a mile of the southern edge of the formation between Marble Hall and the Chester County line.

It is stated that quarries were first opened here about the time of the Revolutionary war, and that up to 1840 this stone was the favorite and almost only material used in the better class of stone buildings in and about Philadelphia. At about the latter date increased facilities for transportation brought the better varieties of eastern marbles and other stones into competition with it and its use has as a consequence considerably diminished. Among the important buildings constructed of the stone during its popularity were the United States custom-house and mint, the Naval Asylum, and Girard College, while the seemingly endless rows of red brick houses with the white marble steps, door and window trimmings are even now as characteristic of Philadelphia as are the brown-stone fronts of New York City.

The sarcophagi for General and Martha Washington, at Mount Vernon, are also of this material. While the Montgomery County stone

* Rep. of First Geol. Surv. of Penna., Vol. I, p. 211.

has shown itself to be very durable, in point of beauty it falls far short of the marbles from the more Eastern States, and hence its use for any form of ornamental work has almost entirely ceased. There were, however, on exhibition at the Philadelphia Exposition of 1876 (and since then transferred to the National Museum) samples of this limestone from along the Lebanon Branch of the Philadelphia and Reading Railroad, some of which gave promise of great utility. I would mention especially two samples from Myerstown and Mill Lane. These are very fine-grained and compact, of a drab or bluish color on a polished surface, and traversed by wavy and very irregularly anastomosing, nearly black lines. They seem in every way admirably adapted for decorative work, though I am not aware that they have as yet been at all used for this purpose. Newberry states* that a fine variety of black marble occurs in or near Williamsport, Lycoming County. I have never seen the stone and know nothing further regarding it. A black limestone that takes a fine polish and appears well suited for interior work is stated also to occur near the east end of Mosquito Valley, in the same county. For exterior work it is stated to be unsuited, as it splinters up badly on exposure.

Tennessee.—The valley of East Tennessee is underlaid by limestone of Lower Silurian age that furnishes some of the finest and most beautiful grades of colored marbles at present quarried in the United States.

The history of the quarrying industry in this part of the State, as given by Dr. Safford,† is substantially as follows: In April, 1838, the Rogersville Marble Company was formed by gentlemen in and near Rogersville, Hawkins County, for the purpose of sawing marble and establishing a marble factory in the vicinity. The company operated to a limited extent for several years, erecting a mill and selling several thousand dollars' worth of material annually, most of which was used within the State limits. In 1844 the company sold out to a Mr. Rice, who shortly after sent a block of the light mottled, strawberry variety to the Washington Monument; another block was subsequently sent, in accordance with an act of the State legislature. These blocks attracted the attention of the building committee of the National Capitol, who finally decided on the adoption of the material for the interior decorative work in the extensions of that building. As a consequence, what was known as the Government quarry was opened, at a point about 9 miles southwest of Rogersville, where the Holston River intersects the marble range. The rock here was in large part massive and the bed several hundred feet in width. Many thousand feet were taken out, being shipped by river and rail to Charleston or Savannah, and thence by water to Washington. Public attention having thus been drawn to the beauty of these stones, there has arisen a constantly increasing demand for them, to supply which other quarries have been opened, and

* Rep. of Judges, p. 138, 139. † Geology of Tennessee.

now "Tennessee marble" is one of the widest known and most generally used of our ornamental stones.

At the present time the most extensive quarries are situated in Knox and Hawkins Counties. The prevailing colors found here are chocolate red and white, often coarsely variegated and fossiliferous; though finely and evenly crystalline varieties of a beautiful pink or "strawberry" color, with scarcely a trace of fossil remains, also occur. All of them cut to a sharp edge and acquire a beautiful and lasting polish not excelled and rarely equaled by any foreign or domestic marbles. Of foreign marbles, so far as the writer is aware, they have no exact counterpart, but perhaps resemble the "Rosso de Levanto" from Spezia, or the Persian "fiorto," more closely than any other that can be mentioned.

Besides the localities above mentioned, colored marbles occur in the following counties in this part of the State: Hancock, Grainger, Jefferson, Roane, Blount, Monroe, McMinn, and Bradley; some also occur in Meigs, Anderson, Union, and Campbell Counties. The Hawkins County marble is part of a comparatively short belt of Trenton and Nashville rocks lying west of Rogersville. It is some 16 or 17 miles long, and from 50 to 300 feet in thickness. The supply is therefore practically unlimited and inexhaustible. The best variety of the stone is used only for ornamental work, owing to its high price, being valued at from $2 to $3 per cubic foot delivered at the nearest railway station.

The Knox County quarries are mostly situated within a few miles of the city of Knoxville. According to Dr. Safford* the entire thickness of the marble bed here is some 300 feet, the different layers of which vary from chocolate red and white variegated varieties through grayish white, pinkish, and more rarely greenish colors. The most esteemed variety has when polished a brownish red color, with white spots and clouds, due to fossil corals and crinoids. The grayish white variety, which is the nearest approach to a truly white marble of any now found in the State, is greatly esteemed for tombstones, monuments, tiling, etc., and is said to be very durable, tombstones which have been exposed for upward of thirty years showing no signs of disintegration or wear. Both the Hawkins County and Knox County stones are very strong and heavy, weighing about 180 pounds per cubic foot, which is some 14 pounds heavier than granite. Quite similar variegated marbles are said to occur in many of the counties of the Cumberland table-land, as in Franklin County, on the Elk River; at the Oil Springs, on Leipor's Creek, in Maury County. Some of the marbles of this latter place have a grayish groundmass, with fleecy clouds of red and green.†

A beautiful olive-green fossiliferous marble is also found in the eleventh district of Davidson County, though the extent of the deposit is not known by the writer. Near Calhoun, in McMinn County, just south

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Op. cit., pages 236, 237.

† Tennessee and its Agricultural and Mineral Wealth, by J. B. Killebrew, page 149.

of the Chilhowee Mountain, occur breccia marbles of exceptional beauty, of pink and olive-green colors. One quite unique stone from this locality is composed of a grayish-ground mass, with large rounded and angular fragments of a lemon-yellow color. These same marbles also occur in Greene, Cocke, Sevier, and all the counties of the Unaka range, but they are not much worked, on account of the hardness of the included fragments.*

Dove-colored marbles are stated by the same authority to occur a few miles south of Manchester, Coffee County, and in Wilson and Davidson Counties. Dark limestones, almost black when polished, and often traversed by veins of calcite, forming a good black marble, are not uncommon, occurring in the vicinity of Jonesborough, Washington County, Greeneville and Newport, Cocke County, on the Pigeons, in Sevier County, and also in McMinn and Polk Counties. They are at present but little used.

Colored marbles are also said to occur† in the Western Tennessee Valley, which, though somewhat inferior in point of beauty to those of the East Valley, are still valuable stones. Perry, Decatur, Wayne, and Hardin Counties are mentioned as offering the best facilities. On Shoal Creek, in Lawrence County, are said to be beds of fawn-colored or brownish-red marbles, some 40 feet in thickness and extending on both sides of the creek for a distance of 15 miles. The stone is often variegated by fleecy clouds of green or red-green and white colors. Owing to lack of transportation facilities it is not now in the market. In Wilson and Davidson Counties other beds of bluish or dove-colored marble occur, and in Rutherford County is a bed of pale-yellow marble with serpentine veins of red and black dots. The extent of the deposit is not known, and at present the stone is seen only in the form of small objects for paper-weights and curiosities.

Texas.—The resources of this State are as yet but little known. There have been received at the National Museum several samples of compact, light-colored cretaceous limestones, from the vicinity of Austin, Travis County, though few of them are of such quality as to be used as marbles. There was on exhibition at the New Orleans Exposition in 1884–'85 a marble fire-place and mantel of Austin marble that was worthy of more than passing notice. The stone was compact, very light drab in color, and interspersed with large fossil shells and transparent calcite crystal. This composition would render some care necessary in cutting, but the final result would seem to justify the outlay. The marbles received from Burnet and vicinity present a variety of colors, some of which are very pleasing. They range from blue-gray and distinctly crystalline to very fine and compact forms, designated as "mahogany-red," "red and white," "purple variegated," etc. The "mahogany-red" is dull in color, and traversed by a net-work of lighter lines. It is too hard and brittle to work economically. The most promising variety is the purple

* Geology of Tennessee, p. 221. † Min. Resources of Tennessee.

variegated. This presents an extremely compact base of a grayish, or light lavender-tint, which is traversed by fine, irregular lines of a red and purple color. The stone acquires an excellent surface and polish, but is so hard as to work with great difficulty.

Utah.—A yellowish white crystalline limestone, that can scarcely be called a marble, was received at the Museum from Payson, in this Territory, and a compact nearly black stone, interspersed with numerous white fossil shells, from the San Pete Valley. Neither stone can lay any claim to beauty, though possibly the last mentioned might be made to do as marble under certain circumstances.

Vermont.—Since this is the leading marble-producing State of the Union a brief description of the chief geological features of the marble formations may not be out of place here. According to Professor Brainard* this formation extends along the western borders of the States of Connecticut, Massachusetts, and Vermont, between the Green Mountain elevation, which extends from the Canada line nearly to Long Island Sound, and the intermittent Taconic Mountains, which extend south of Lake Champlain, and in places admit the marble veins within the border of New York. Of these immense formations, which are from 1,000 to 2,000 feet in thickness, the lower portion, known to geologists as the calciferous (300 to 400 feet in thickness), is for the most part siliceous, partaking of the nature of the sandrock that underlies it. The upper portion, known as the Trenton (500 to 600 feet in thickness), is impure from the presence of clayey matter, partaking of the nature of the slate formation that overlies it. Only certain layers of the middle portions seem to have been fitted by their original constitution for the production of marble.

These strata in Rutland and Addison Counties appear in two parallel lines about 2 miles apart, stretching from the north line of Middlebury to the south line of Rutland, and are from 100 to 200 feet in thickness. The limits of the formation may be best understood by reference to the accompanying map (Plate VII), redrawn from Professor Brainard's report.†

Professor Hitchcock‡ conveniently divides the marbles of this State into four groups or classes: (1) the common white and bluish or Eolian marble (so called from its occurring extensively on Mount Eolus); (2) the Winooski; (3) the variegated of Plymouth, and (4) the dark, almost black, of Isle La Motte. Of these the Eolian is most abundant by far, and is most extensively quarried. In texture the stone is fine-grained and often saccharoidal, though less so than the Italian marbles. In color it varies from pure snowy white through all shades of bluish, and sometimes greenish, often beautifully mottled and veined, to nearly black, the bluish and black varieties being as a rule the finest and most durable.

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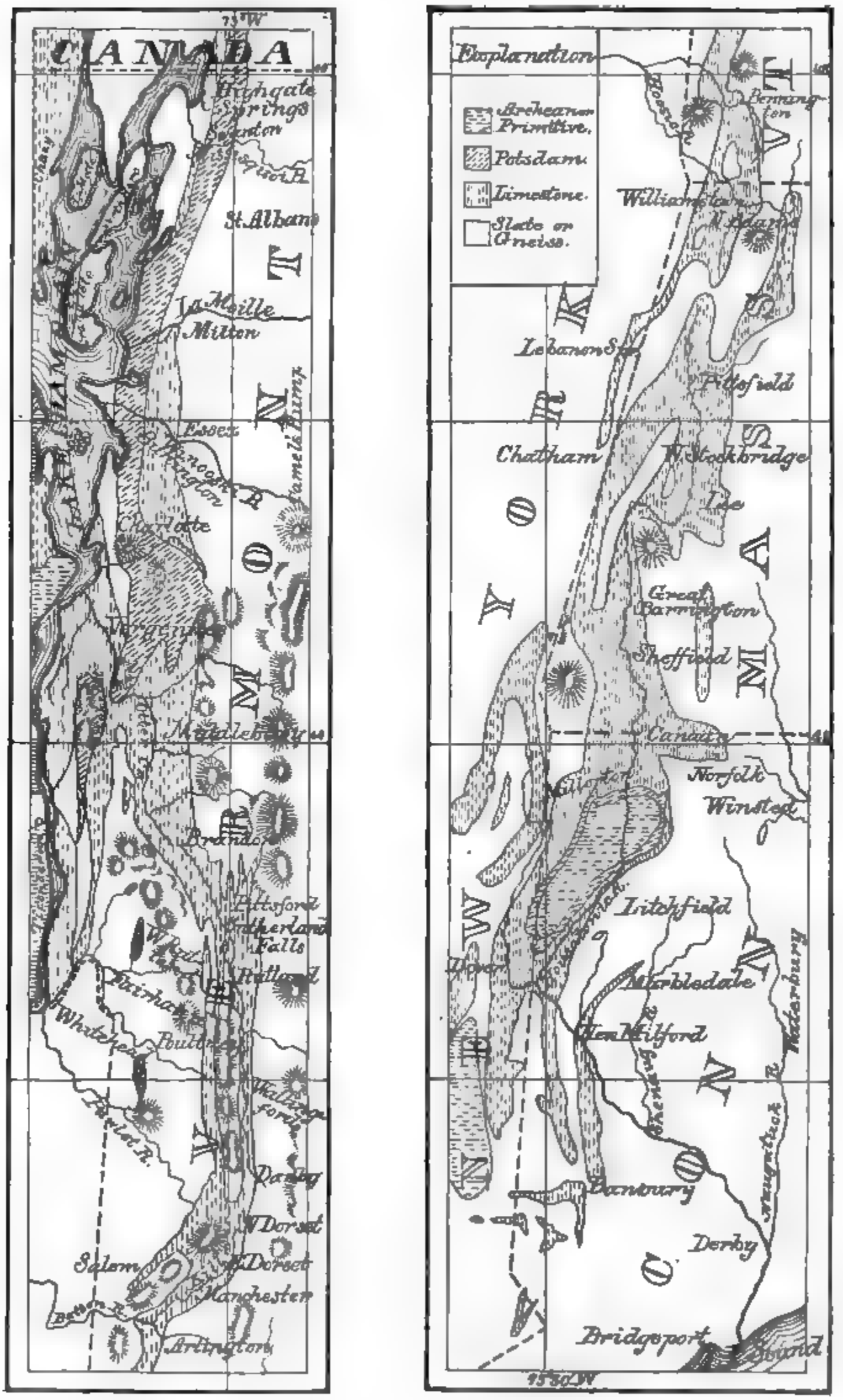
* The Marble Border of Western New England, p. 9.

† By permission of the Middlebury Historical Society.

‡ Geology of Vermont, Vol. II, page 752.



MARBLE REGION OF WESTERN NEW ENGLAND.

The stone occurs in beds usually but a few feet in thickness, which vary considerably in color, so that several grades, from pure white through greenish, bluish, and almost black, may be taken from the same quarry.* As a rule the best marbles in the State occur where the beds or strata stand at high angles, as at West Rutland. The quarries themselves at this village lie along the western base of a low range of hills, which, to the ordinary observer, give no sign of the vast wealth of material concealed beneath their gray and uninteresting exterior. In quarrying, the best beds are selected, and upon their upturned edges excavation is commenced, first by blasting, to remove the weathered and worthless material, and afterward by channeling, drilling, and wedging; no powder being used lest the fine massive blocks become shattered and unfit for use. The quarry thus descends in the form of a rectangular pit, with almost perpendicular, often overhanging, walls, to a depth of sometimes more than 200 feet, when the beds are found to curve to the eastward and pass under the hill, becoming thus more nearly horizontal; in following these the quarry assumes the appearance of a vast cavern from whose smoke-blackened, gaping mouths one would little suppose could be drawn the huge blocks of snow-white material lying in gigantic piles in the near vicinity (see Plate I). Some of the quarries have been partially roofed over to protect them from snow and rain, and seem like mines rather than quarries. The scant daylight at the bottom is scarce sufficient to guide the quarryman in his work. As one peers cautiously over the edge into the black and seemingly bottomless abyss, naught but darkness and ascending smoke and steam are visible, while his astonished ears are filled with such an unearthly clamor of quarrying machines, the puffing of engines, and the shouts of laborers, as is comparable with nothing within the range of our limited experience.

The stone taken from the quarries is worked up in the companies' shops in the immediate vicinity or shipped in the rough as occasion demands. The supply is used for monumental, decorative, or statuary work and general building.

Other quarries in which the stone so closely resembles that of Rutland as to need no special description, are situated at East Dorset and Dorset, Wallingford, Pittsford, Sutherland Falls, Brandon, and Middlebury. At Sutherland Falls the stone is very massive, and large

* Professor Hitchcock (Geology of Vermont, Vol. II, p. 764) gives the following figures relative to the marble-beds at one of the West Rutland quarries, beginning at the eastern side or top layer:

1. Upper blue layer, 4 feet thick.
2. Upper white layer, 3 feet 6 inches thick.
3. Gray limestone layer, 5 feet thick.
4. White statuary layer, 3 feet thick.
5. Striped layer, 1 foot 8 inches thick.
6. New white layer, 4 feet thick.
7. Wedged white layer, from 8 inches to 2 feet 6 inches thick.
8. Muddy layer, 4 feet thick.
9. Striped green layer, 4 feet thick.
10. Camphor-gum layer, 3 feet thick.
11. White layer, 9 feet thick.
12. Blue layer, 3 feet 6 inches.

blocks are taken out for building purposes. Some of the most valuable, according to Professor Seely,* are known as the dark and light *mourning vein* varieties. The dark mourning vein has a ground of deep blue, while lines, nearly black, run through it in a zigzag course, presenting a beautiful appearance. The light mourning vein has similar veins, but the ground is lighter. The quarries at this place are described by Professor Seely as being in the form of a hollow cube cut into a hill with perpendicular walls on the north and west rising to a height of nearly 100 feet, open to the sky, and with an acre of rock forming its horizontal marble floor. Over this floor are running channeling machines, cutting out long parallel blocks which are afterwards cut up into convenient size, lifted from their beds, and taken to the mills to be sawn. Some sixty gangs of saws are kept running here day and night during the busy season, and not less than five hundred persons, all told, are employed in and about the quarries. The workmen are of many nationalities, including English, Scotch, Welsh, Irish, Canadian, and Italian.

As stated by Professor Hitchcock,† the beds of the Eolian variety of marble are not restricted to one locality but extend over a large portion of western Vermont, the formation in which it occurs extending the entire length of the State, usually interstratified with siliceous and magnesian limestones. The strata vary in thickness from a few inches to 6 or 8 feet, the thickest beds being usually found where the marble is coarse-grained and friable. From Dorset the beds thin out toward the north, the more northerly beds, though thinner, usually furnishing the finer grained and more compact stone. It is stated‡ that Pittsford has the honor of having one of the earliest quarries in the State, if not the earliest, Jeremiah Sheldon having worked marble here as early as 1795. There are three beds or veins of marble running through the town, north and south. The most easterly has a breadth of some 200 feet, and the stone is of the same character as that at Sutherland Falls or Proctor, as the town is now called. The middle bed is separated from the first by about 200 feet of lime rock. The bed itself is some 400 feet wide, and the stone varies in color from pure white to dark blue. The third or west bed which is thought to correspond to that of West Rutland is about half a mile west of the central and is about 400 feet wide. The stone is dark-blue and often beautifully mottled. Some of the beds here, as at West Rutland, furnish a beautiful snow-white saccharoidal stone suitable for statuary purposes, for which it has been used to a slight extent. The Vermont statuary marble, however, differs from its Italian prototype, in being of a dead white color and lacking the mellow, waxy luster so characteristic of the Italian stone.

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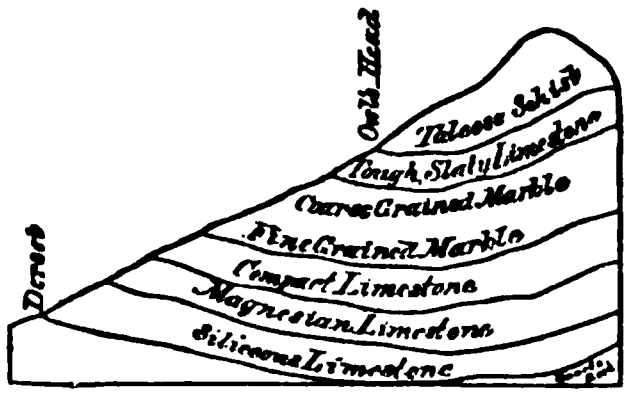
* *Op. cit.*, p. 41.

† Geology of Vermont, Vol. II, p. 772.

‡ The Marble Border of Western New England, p. 46.

Several outcrops of marble occur in Middlebury, and which have been worked for many years past; but in consequence of the thinness of the beds, their badly-pointed structure, and the interstratification of a magnesian state that produces numerous "rising seams," it is quite difficult to obtain perfectly sound blocks of large size.*

The quarries in Dorset are situated mostly upon the sides of Mount Eolus, or Dorset Mountain, as it is also called, a section of which (after Hitchcock) is here given.



The thickness of the slaty cap rock is estimated by Hitchcock at 498 feet, and the various beds of limestone below at 1,970 feet. Although but a small portion of this is suitable for quarrying, still the supply is readily seen to be inexhaustible. The prevailing colors of the stone, as at Rutland, are white and bluish, variously mottled and veined. According to Professor Seely† the first quarry opened in Dorset was by Isaac Underhill, in 1785; the stone being used chiefly for fire-jambs, chimney-backs, etc. The first marble grave-stones ever furnished here were the work of Jonas Stewart, in 1790.

The bed of primordial rock known to geologists as the "red sandrock," which occur in the northwestern part of the State, bordering on Lake Champlain, is, as a rule, a hard, dark-red sandstone, containing some 8 or 9 per cent. of potash, with about the same amounts of iron and lime. The entire formation, which is some 2,000 feet in thickness, is, however, by no means uniform in composition, but includes considerable beds of limestone, dolomite, slate, and shale. It is the dolomitic layer which furnishes the peculiar red-and-white mottled stone popularly known as Winooski marble. According to a writer in the American Naturalist,‡ the beds of this marble appear first one or two miles north of Burlington and extend in a somewhat interrupted series north through Saint Albans, and end between that place and Swanton. More than thirty years ago a quarry was opened in this rock about 6 miles from Burlington, but owing to the hardness of the stone the enterprise proved a failure and the quarries were abandoned. Later quarries were opened at Saint Albans, and still more recently were re-opened at Burlington, the stone being used largely for flooring-tiles, wainscotings, and general interior decorative work. As a rule the stone is crystalline and very hard, much harder than ordinary marble. Its color is

* Geology of Vermont, Vol. II, p. 769.

† *Op. cit.*, p. 36.

‡ George H. Perkins, American Naturalist, Feb., 1881.

quite variable, though some shade of red mottled with white usually predominates. Some varieties are beautifully light pink and white, or pink and deep-blue gray or greenish. The very common chocolate-red and white variety is put upon the market as *Lyonaise marble*, and is used largely for tiling, its natural color being often rendered darker by oiling.

Chemically the stone is a dolomite, though varying widely in composition in samples from different localities. Some samples show a very decided brecciated structure, while in others this entirely disappears. It is as a rule very hard to work, and, as exhibited in the capitol at Albany, the surface is often disfigured by irregular cavities and flaws which are rather unsightly. The color is said to fade on exposure to the weather, and hence the stone is used mostly for interior work.

An excellent outcrop of this marble occurs on the shore of Mallet's Bay, in the town of Colchester. The strata at this point are nearly horizontal, and in many places form the banks of the lake. One of the best quarries is so situated that a vessel can be brought up alongside and loaded with blocks with as much ease as they are usually loaded upon carts or cars at inland quarries. The stone occurs in beds varying in thicknes from 1 to 6 feet, and blocks of almost any size can be obtained. It is hard to work, but as a consequence is very durable when once finished, being not easily scratched or scarred.

The best developments of the rock for marble quarrying are at Colchester, as already mentioned, Milton, Georgia, Saint Albans, and Swanton. At the last-named place there also occurs a beautiful gray marble, with angular fossil fragments of a white and pink color, identical with the "Lepanto" marble of New York. There is also a fine and compact dove-colored marble here, admirably adapted for decorative work, but the quarries are now abandoned.

The Plymouth marble, so called, is a quite pure dolomite, an analysis by Dr. Hunt resulting as follows:

	Per cent.
Carbonate of lime	53.9
Carbonate of magnesia	44.7
Oxyde of iron and alumina	1.3
	99.9

The stone occurs in the talcose-schist formation near the center of the town of Plymouth, at an elevation of 250 feet above the Plymouth pond. Quarries were opened here about 1835, but were soon abandoned, as the demand at that time was almost altogether for white marble. The beds dip 60° to the east, and the quarry walls, which have been exposed to the weather for twenty years, seem unaffected. In color the stone is blue or bluish-brown, diversified with long stripes and figures of various shapes in white. It is fine grained and compact, splitting with equal facility in every direction.*

* Geology of Vermont, Vol. II, p. 776.

The Isle La Motte marble derives its name from Isle La Motte, in Lake Champlain, where it occurs in considerable abundance. It also occurs on several other islands in this lake and upon its banks in many places. According to Professor Hitchcock* this was the first marble worked in the State, quarries having been opened prior to the Revolutionary war. The stone, which is largely used for flooring-tiles, is very dark, almost black in color, and highly fossiliferous, having undergone less metamorphism than the marble in the interior of the State. So far as the author has observed its color and texture are such as to preclude its obtaining a high rank for purely decorative purposes, but for floor-tiling is much esteemed and very durable. Fossil shells of great beauty are not uncommon, and, being snowy white in color, show up in strong contrast to the dark paste in which they are embedded.

Virginia.—The extensive area comprehended under the title of the Valley of Virginia embraces "all the portion of the State having for its eastern boundary the western slope of the Blue Ridge and its inflected continuation, the Poplar Camp and Iron Mountains, and for its western, the Little North and a portion of the Big North Mountain, with the southern prolongation of the former, Caldwell and Brushy Mountains; and near its southwestern termination the line of knobs forming the extension of Walker's Mountain."†

The central portion of the valley as thus outlined is underlaid largely by limestones of Silurio-Cambrian age, which are in several places, according to the authority above quoted, capable of yielding good marbles. The special varieties mentioned are: (1) a dun-colored marble met with near New Market and Woodstock, and on the opposite side of the Massanattep Mountain in Page County; (2) a mottled bluish marble to the west of New Market; (3) a gray marble occurring some three-fourths of a mile in a southeasterly direction from Buchanan, in Botetourt County; (4) a white marble of exquisite color and fine grain about 5 miles from Lexington, in Rockbridge County; (5) a red marble occurring only in the Cambrian formations lying among the mountains in the more southwestern counties; and (6) a shaded marble found in Rockingham County. This last is said to be compact, susceptible of a beautiful polish, and of a yellowish gray and slate color. None of the above have as yet received more than a local application.

At Craigsville, in Augusta County, there occurs a gray, sometimes pink-spotted encrinal limestone which acquires a good polish, and though in no way remarkable for its beauty is capable of extensive application for furniture and interior decoration. The Archæan area to the eastward of the Valley of Virginia also includes sundry areas of workable marble. It is stated by Rogers‡ that "near the mouth of the Tye River (in Nelson County) and the Rockfish, a true marble is

* *Op. cit.*, p. 776.

† Rogers, Geol. of the Virginias, pp. 203, 204.

‡ *Op. cit.*, pp. 81–83.

found, of a beautiful whiteness and of a texture which renders it susceptible of a fine polish as well as being readily wrought with the chisel. A few miles from Lynchburgh, in Campbell County, a good marble is likewise found." "The Tye River marble and one or more analogous veins" are further stated to "have all the characters of a statuary marble of fine quality, and should not some peculiarity, as yet unperceived, prevent their application to the purposes of the sculptor, they will no doubt be looked upon as very valuable possessions." The writer has seen none of the material from this locality. White and pink marbles of excellent quality also occur in the vicinity of Goose Creek, in Loudoun County. We have seen samples of the white, which for purity of color, fineness of grain, and general excellence, are not excelled by any marble now quarried in the United States, but the extent of the deposit is as yet unknown.

The stalagmitic deposits upon the floors of the caverns at Luray, in Page County, furnish, when cut, occasional fine pieces of the so-called onyx marble, but the stone is too easily fractured and too uneven in texture to be worked economically, even were the deposits of sufficient extent to warrant the opening of quarries. I am informed by Prof. G. B. Goode that it is a common thing to find mantels of stalagmitic marble in the dwellings of Virginia. These are, however, always made from blocks found loose in the field or in caves near at hand.

(4) LIMESTONES AND DOLOMITES OTHER THAN MARBLES.

Alabama.—A dark compact limestone has been received at the Museum from Calera, Shelby County, and a light-colored, finely fossiliferous one from Dickson, in Colbert County. The last mentioned closely resembles in general appearance the celebrated limestone from Bedford, Ind., to be noticed later. It appears of good quality, and works readily.

Arkansas.—Oolitic limestone suitable for building, and having the reputation of being very durable, is stated by Mr. Owen * to occur near Batesville, in Independence County.

Colorado.—The collections show from this State a coarse, reddish limestone from Jefferson County, and also a very compact, finely crystalline black stone, traversed by a coarse net-work of very fine white lines, from Pitkin in Gunnison County. This last stone takes a polish, and might almost be classed as a marble. Neither stone is now quarried to any extent.

Florida.—This State at present furnishes scarcely anything in the line of building stone, nor is there much demand for any other form of building material than wood. On Anastasia Island, about 2 miles from Saint Augustine, there was formerly quarried to a considerable extent a very coarse and porous shell limestone which was used in the construction of the old city of Saint Augustine and of Fort Marion, which was

*Geol. of Ark., Vol. I, p. 220.

built about the middle of the eighteenth century. The rock is composed simply of shells of a bivalve mollusk more or less broken and cemented together by the same material in a more finely divided state. Fragments of shells an inch or more in diameter occur. The rock is loosely compacted and very porous, but in a mild climate like that of Florida is nevertheless very durable. The quarries were opened upwards of two hundred years ago, but the stone is not now extensively used, owing in part to the dampness of houses constructed of it, and in part to the cheapness of wood. The rock, which is popularly known as *Coquina* (the Spanish word for shell), is of Upper Eocene age. In the quarries the stone lies within a few feet of the surface, and can be cut out with an ax, in sizes and shapes to suit.

The oolitic limestone occurring at Key West has been quarried and used in the construction of numerous private and public buildings in that vicinity.

Kansas.—The limestones and dolomites of this State are, as a rule, of a light color, soft and porous and incapable of receiving a polish such as will fit them for any form of ornamental work. Many of them are cellular and loosely compacted, being made up in large part of a small fossil rhizopod about the size of a grain of wheat and known under the name of *fusulina*. Such stones are obviously unfitted for exposed work in localities subject to great extremes of temperature, although they may be very durable in mild or dry climates. Those at present quarried are almost without exception of Carboniferous or Permian age, and occur only in thin beds, varying from a few inches to 8 or 10 feet in thickness.

Near Irving there occurs a light-colored, soft, thin-bedded stone, which, though not quarried during the census year, has in times past been used for building purposes in Atchison and Kansas City. It is soft and easily quarried and for ordinary construction requires but little dressing. At Frankfort a similar stone occurs which has been used to some extent for buildings, though principally for foundations. Some of the stone from these localities are of very poor quality, being soft and quite cellular through the breaking away of the small fossils above referred to. Atchison, in the same county, has quarries of a darker, more compact stone, which are worked for local use.

In the vicinity of Topeka there are quarried light-colored, compact, finely fossiliferous dolomites and limestones which work very readily, and which have been used in the construction of about thirty-five common buildings in that city, besides a church, school, and opera houses in Emporia. They have also been used in Parsons, in Labette County, and neighboring towns in Missouri.

Near Lane, in Franklin County, gray and buff limestones are quarried and used quite extensively in Ottawa and Garnett, in the same State, though some have been shipped to Chicago. The buff variety is sometimes oolitic, resembling to some extent the Bedford (Indiana) stone.

The texture is firm and compact, and it acquires a good surface and polish. The gray variety is coarser, and often somewhat cellular, owing to the imperfect filling of the spaces between the fossil particles of which it is composed. A section of the quarry shows the gray stone to occur in a bed about 4 feet in thickness, and the buff oolitic about 6 feet in thickness, the layers of which vary from 18 to 24 inches each.

Near Marion Center, in Marion County, there is quarried a light-drab cellular magnesian limestone of Permian age, that has been used in the construction of the asylum for the blind and insane at Wyandotte and Topeka, in this State. Similar stones are quarried at Cottonwood, in Chase County. The stratum of quarry rock here is some 6 feet in thickness and blocks of any desired size and of thickness not exceeding 2½ feet can be obtained. The principal markets for these stones are Kansas City, Mo.; Lincoln and Omaha, Nebr.; Pueblo and Denver, Colo., and Atchison, Topeka, and Leavenworth, Kans.

In the vicinity of Fort Scott are some half a dozen irregularly worked quarries which furnish stone for building foundations and pavements in the near vicinity. The stone is dark colored, fine grained, and semi-crystalline, and is said to stand the wear of from ten to fifteen years' exposure very well. It turns to a brownish color on long exposure and is strong enough for ordinary structures. The stone quarried at Winfield is a light-colored, fine-grained cellular rock and so soft as to be quarried by means of plug and feathers only, the holes being first bored by means of a common auger without point. It is a handsome stone and has a good reputation for durability. It is used mostly in this State, though some is shipped to Kansas City, Mo.*

Many of the towns in Butler County produce fine-grained, light-colored limestones suitable for rough building in the immediate vicinity, but not at all suitable for ornamental work.

Illinois.—No siliceous crystalline rocks of any kind are to be found within the State limits, almost the entire product being limestone or dolomites, with a few quarries of sandstone, which are noticed on p. 448.

The most notable of the limestones of this State is the fine-grained, very light-colored Niagara stone, quarried in the vicinity of Lemont and Joliet, in Will County. According to Professor Conover,† the Lemont quarries lie on both sides of the Illinois and Lake Michigan Canal, and the beds of stone are quarried to their lower limits through a variable thickness of from 12 to 40 feet. The stone here is uniformly a fine-grained, homogeneous, light-drab limestone, occurring in beds from 6 to 24, and sometimes 30 inches in thickness. The beds are divided vertically by seams occurring at intervals of from 12 to 50 feet, and continuing with smooth faces for long distances, and also by a second set running nearly at right angles with the first, but only continuous between massive joints and at irregular intervals. This structure renders

*Professor Brodhead in Report of Tenth Census, pp. 275-277.

† Report of Tenth Census, p. 221.

the rock very easily quarried and obtainable in blocks of almost any required dimensions. The stone is soft and easily worked, taking readily a smooth surface, but no polish. It can be turned on a lathe, and is made into balustrades and other forms of ornamental work. It can be carved in bas-relief, but is not sufficiently tough for high reliefs that are to be exposed to the weather. To produce smooth surfaces for flagging, etc., the stone is planed by machines somewhat similar to those used in planing iron. The stone from the immediate vicinity of Lemont is said to contain less iron and to tarnish less readily than that a few miles distant at Joliet.

The stone in the quarry contains much moisture, and during cold weather care has to be taken to avoid injury by freezing until the quarry water has evaporated. This causes a considerable annual expense in making earth protections, except in those few quarries that are so situated that they can be flooded with water during the winter months.

The quarries extend for nearly 4 miles below Lemont, where a gap occurs, to just below Lockport, from which point a line of closely-adjoining quarries extend to below Joliet. The finer varieties of the stone do not seem well fitted for heavy masonry in damp situations. Fine clay seams abound, which are invisible when the stone is first quarried, and which under favorable circumstances do not develop at all, but when exposed to heavy pressure or to alternate moisture and dryness, accompanied by frost, they are soon developed, and often render the stone worthless. Even the best varieties of the stone tarnish after a short exposure, especially in cities where soft coal is burned.

The Joliet quarries extend from a point about a mile below Lockport to the same distance below Joliet. Two distinct varieties of stone occur. That quarried from the lower beds on the right bank of the river is as a rule rougher, more coarsely textured, and tarnishes more readily than that from the higher levels. It is now but little used, except for heavy masonry. In the quarries back from the river, on the higher levels, the stone is fine grained, more homogeneous, and in this respect fully equal to the Lemont stones. The beds now worked are from 3 to 4 feet in thickness, and large blocks are obtainable. Most of it seems to weather-stain rather more than that from Lemont. The value of the stone quarried at these two places is probably fully equal to that of all the other stone quarried in the State.*

Three large quarries are worked in these same formations at Batavia, but as a rule the stone is coarser and more difficult to work than those just described. Other quarries occur at Thornton and Blue Island, Cook County, and other parts of the State, as noticed in the catalogue

* These beds were formerly described as composed of light buff stone, while the deeper portions of the quarries now furnish "bluestone." The difference results from the difference in amount of oxidation of the small amount of iron disseminated through the whole mass, the change having resulted from atmospheric influences. The same change must ultimately take place in all the bluestone which is brought to the surface. (Geology of Illinois, Vol. IV, p. 220.)

of the Museum collection. Within the city limits of Chicago there is quarried from this same formation a coarser somewhat cellular stone, that from its unique character perhaps merits a special description. According to Hunt* this stone when pure is a nearly white granular crystalline dolomite, containing 54.6 per cent. carbonate of lime. It, however, contains so large a portion of bituminous matter, that blocks sometimes become quite black on exposure. The color fades somewhat in time, but the petroleum odor is often perceptible for long distances. The stone has been used to some extent for building purposes, as notably in the First Presbyterian Church in Chicago. The gummy bituminous matter causes the dust from the streets to adhere to exposed surfaces, thus giving the buildings a peculiar antique appearance. We are informed by Mr. Batchen that this pseudo-antique appearance is greatly admired by some. The presence of the bitumen is beneficial in at least one respect, in that it renders the stone less pervious to moisture, and hence less liable to disintegration by freezing. This stone is represented by an 18-inch cube in the Museum collections.

Lower Silurian (Trenton) limestones and dolomities are quite extensively quarried in Jo Daviess County, and make a handsome and very durable building material. Calhoun, Alexandria, and Ogle Counties also furnish good material, but which, for lack of space, can not be described here. At various points in Whiteside and Hopkins Counties there are outcrops of limestones belonging to the Cincinnati group, a part of which will furnish durable building material. The stone needs, however, to be selected with the greatest care, since all the beds are not of equal quality.

At Jonesborough, in Union County, there occurs a fine, even-grained, compact, beautifully oolitic stone that cuts to a sharp even edge, and seems admirably adapted for carved work and general building purposes as well. Specimens in the National Museum are of a lighter color than the Bedford, Ind., oolotic stone and take a better polish. We have had no means of ascertaining its lasting qualites, but it is stated† to be liable to injury from frost when exposed in damp places. The stone is of the Carboniferous age. Other oolitic stones occur at Roseclair, in Hardin County. They are of a dark bluish-gray color and take a good polish.

There are many other localities in the State which furnish excellent varieties of building stone. These can not be mentioned here for lack of space. Interested parties are therefore referred to the catalogue of the Museum collections and to the report of the Tenth Census.

Indiana.—Few of the limestones at present quarried in the United States exceed in reputation and beauty the fine-grained oolitic stone of sub-Carboniferous age from the vicinity of Bedford, in this State, and popularly known as "Bedford limestones." The rock is of fine and

* Chemical and Geological Essays, p. 172.

† Report of Tenth Census, p. 225.

even texture, and is composed of small rounded concretionary grains of about the size of a grain of mustard seed compactly cemented together by crystalline lime or calcite. The stone is soft, but tenacious (specimens having borne a pressure of 12,000 pounds per square inch), and works readily in every direction. It is therefore a great favorite for carved work, and is used more extensively for this purpose than any other of our limestones. No better example of the adaptability of the stone for this purpose can be given than the elegant mansion of Mr. C. J. Vanderbilt, on Fifth avenue, in New York City. Unfortunately, as is usually the case with light limestones, this stains badly in cities where there is a great amount of manufacturing, as is only too well illustrated in the case referred to.

Although the quarries have been worked systematically for but a few years, the stone is already widely known, and is coming into very general use in nearly every city of importance in the country. At the principal quarries, which are situated near Bedford, Lawrence County, the stone occurs in a solid bed, that has been worked to a depth of 40 feet without reaching the bottom.

Stones very similar in general appearance, but not always so distinctly oolitic and often containing a considerable percentage of bituminous matter, also occur and are extensively quarried at Ellettsville, in Monroe County. Other localities not so extensively worked occur in Owen, Washington, Crawford, and Harrison Counties. Samples received at the Museum from near Corydon in the last-named county are of a beautifully fine and even oolitic structure, very light color, firm and compact. They resemble the oolitic stone from Princeton, Ky., more closely than any other, but are much more compact. The stone is stated to occur in inexhaustible quantities.

The Washington County deposit at Salem is said to be a very fine one, there being a solid bed of the oolite 30 feet in thickness, with only about 5 feet of cap rock.

Other limestones or dolomites of excellent quality, but lacking the oolitic structure, occur in many parts of the State. A compact, fine-grained drab stone, taking a very good polish and also of subCarboniferous age, occurs at Greencastle, Putnamville, and Okalla, in Putnam County, and is quarried for lime and for building purposes in the various cities and towns in the vicinity. There is quarried at Bedford also a fine grained semi-crystalline, dark-gray stone, which is capable of a variety of uses.

Near Silverville, in Lawrence County, there occurs a very fine-grained compact stone of a drab color, that acquires readily a smooth and even surface. An attempt has been made to utilize this for lithographic purposes, but, it is stated, with indifferent success. It bears a close resemblance to the darker variety of the well-known Bavarian lithographic stone, but is somewhat harder.

As will be noticed, nearly all the quarries mentioned lie in that por-

tion of the State south of Indianapolis. But few quarries of importance lie to the north of this point, and when worked the stone is used principally in the manufacture of quicklime. At Anderson, in Madison County, a light-colored, fine-grained stone occurs in beds of from 4 to 12 inches in thickness, which is used locally for flagging and general trimming purposes.

Iowa.—Although this State abounds in limestones and dolomites to the exclusion of almost all other varieties of building stone, but little of the material now quarried is of such a nature as ever to acquire more than a local reputation. Though having altogether more than three times the number of quarries found in Illinois, these are mostly small affairs, and the value of the total product is but little more than one-half that of the latter State. At the time of the taking of the Tenth Census the whole number of quarries in the State was 131, of which 128 were of limestones and dolomites, and the remaining 3 of sandstone, which are mentioned on p. 449.

At the present time the most important quarries are situated in the Niagara division of the Upper Silurian formations, in the vicinity of Stone City, Jones County; Farley, Dubuque County, and in various portions of Jackson, Cedar, Clinton, and Scott Counties. The Jones County stone is a very light-colored, fine-grained and compact bituminous dolomite. That from Farley is very similar in general appearance, but contains less bituminous matter. In the small blocks received at the Museum the stones appear of good quality, but we have had no opportunity of learning their weathering qualities.

A finely crystalline light-colored limestone of sub-Carboniferous age is quite extensively quarried near Burlington, in Des Moines County. According to Professor McGee* this stone, which is practically identical with that of Keokuk, in Lee County, is used chiefly for common masonry, and only occasionally for dressed work. The upper beds are "nearly white in color, fine, compact, homogeneous, and hard, with a choncoidal or splintery fracture, like the so-called lithographic limestone of nearly the same geological age. This stone has been used to some extent for ornamental purposes, but contains too many incipient fractures, and is too liable to unexpected disruption to be of special value."

Near Le Grand and Montour, in Tama County, there occurs a magnesian limestone of the same age as that just described, which is fine grained, compact, and generally buff or whitish in color. The coarser portions are extensively used for heavy masonry, while the finer grades, which are often beautifully veined with iron oxides, are used for ornamental work under the name of "Iowa marbles." Some of the stone from this locality is oolitic. Similar stones are extensively quarried at Iowa Falls and at Humboldt and Dakota, in Humboldt County. Lime-

* Report of Tenth Census, p. 261.

stones and dolomites belonging to the Saint Louis epoch of the Subcarboniferous age are quite extensively quarried in various parts of Lee, Des Moines, Henry, Washington, Van Buren, Jefferson, Keokuk, Wapello, Manhaska, Marion, Story, Hamilton, and Webster Counties. That from near Farmington, Van Buren County, varies from light buff to nearly white in color, is fine grained, and has been quarried for lithographic purposes. It is, however, no longer used, having been found to contain too many dry seams often cemented by crystalline carbonate of lime. At Chequest the limestone takes a fair polish and is known as "Chequest marble."

In the Devonian limestones near Iowa City and Roberts Ferry there frequently occur masses of fossil coral (*Acervularia davidsoni*) which, when cut and polished, form beautiful ornaments and paper-weights, though of small size. They are known popularly as bird's-eye and fish-egg marbles.

One of the most unique marbles in this country is found in the Devonian beds near Charles City. The stone, which is known commercially as "Madrepore marble," consists of a fine grained and compact non-crystalline groundmass of a yellowish-brown or drab color, in which are embedded a great variety of fossil forms and shapes, including large stromatopora sometimes a foot or fifteen inches in diameter. The stone polishes well and the fossil forms show up in a manner peculiarly beautiful and unique. This marble is represented in the Museum collections by a large polished slab (catalogue No. 38465) as well as by the smaller specimens in the systematic series.

Kentucky.—Although the building stones of this State are entirely unknown in our principal markets and but few of them have more than a strictly local reputation it by no means follows that there is any lack of material or that it is at all inferior in quality. While it is true that no marbles or granites of importance are found, yet there abound limestones of the finest quality and in inexhaustible quantities. The oolitic limestones of this State are without superiors, if indeed they have equals. Through the energy of Prof. J. R. Proctor the Museum has received a full series of these stones, and we are able to speak of their qualities from personal observation. In Todd, Grayson, Meade, Simpson, Christian, and Caldwell Counties oolitic stones occur of very light, almost white, color and excellent quality. The varieties from Litchfield and Princeton are especially worthy of mention. The oolitic character is very pronounced in these stones, and while in some cases the production of a perfect surface is impossible, owing to the breaking away of these minute rounded grains, still in the better qualities the sharp edges and smooth surfaces are as readily acquired as on the celebrated Bedford (Ind.) or other stones of this character. These are superior to the Bedford stone, moreover, in their clear and uniform colors, never being blotched with oil, as is the Bedford stone. Professor Proctor informs us that the stone is quarried with ease, is easily wrought, stands

ure well, and is considered one of the most reliable stones in the State.

Compact fine-grained limestones of a dark drab color, taking a smooth surface, but not suited for marble, are found in the towns of Franklin, Simpson County; Lebanon, Marion County; Russellville, Logan County, and others. A part of the Franklin County stone is fine grained and suitable for lithographic purposes, though inferior to the imported Bavarian stone. Very light colored compact limestones are found also in Simpson, Logan, and Franklin Counties, but we have no information regarding their availability or the extent to which they are quarried.

Maine.—Limestone is an abundant and common rock in this State, especially in the southeastern part, in the counties of Knox and Lincoln, where it is very extensively burnt into quicklime. So far as I am aware none of the stone is utilized for building, as its colors—blue and blue-black, veined with white—are poorly adapted for such purposes. No stone suitable for marble is yet known to occur in the State, though Hitchcock* expresses the opinion that such may yet be found in "the belt of Helderberg limestone, running from Matagamon (east branch Penobscot) River northeasterly."

Many samples of so-called white marbles have been taken from the limestone formations about Rockland, in Knox County, but, so far as observed by the present writer, they are all too coarsely crystalline or too distinctly granular in structure to be of value.

Michigan.—Limestone or dolomites of a character suitable for building purposes are at present but little quarried in this State, the entire value of the output during the census year being but about $26,000. A fine-grained fossiliferous dolomite of a drab color is worked at Sibley's Station, in Wayne County, and a very light-colored granular rock, of similar composition, near Raisinville, in Monroe County. Near Alpena light-colored limestones are quarried which are hard, compact, and said to be durable. They are not obtainable anywhere in large quantities nor in blocks of large size, but there are numerous small openings sufficient to supply the local demand. Other localities where stone can be obtained are at Trenton, near Detroit, and upon Macon Creek, both in Monroe County. The stone is apt to contain dry seams and requires care in selecting. These are all of Devonian age.

Minnesota.—The Lower Silurian limestones and dolomites of this State, which are at present the only ones quarried, are, as shown by the Museum collection, nearly all of a light buff, drab, or blue color, fine-grained and compact, though in some cases cellular and semi-crystalline, according to Professor Winchell.†

The stone appears in the bluffs of the Mississippi River and St. Croix Valley, and is quarried at all points where (except Lake City) there is any demand between Stillwater and Winona, along the Mississippi Val-

* Second Annual Rep. Geol. of Maine, 1862, p. 428.

† Rep. Tenth Census, p. 249, and Geol. of Minn, vol.

ley on the Minnesota side, and also at several places farther west, as at Caledonia, in Houston County, Lanesborough and Rushford, in Fillmore County, and at points in Winona County.

At Stillwater the rock is a silicious dolomite of a light buff color. In the ledge, which is about 45 feet thick, it occurs in alternate bands of compact and cellular rock varying from 3 to 6 feet in thickness. The coarser variety is most durable and is used in heavy masonry, as bridges and foundations. The finer variety is used for house trimming, ashlar work, and tombstones.

At Saint Paul the rock is a fine light-bluish semi-crystalline magnesian limestone. It is usually quite regularly stratified, and occurs in beds from 3 to 24 inches in thickness, with joints from 10 to 30 feet apart. Blocks 10 by 5 by 2 feet can be obtained if desired. It is used only locally. At Minneapolis the rock is quite similar, though sometimes slightly fossiliferous or mottled with argillaceous spots. It was formerly used almost exclusively in Minneapolis, but is now being gradually replaced by stone from the neighboring States.

In speaking of these stones Professor Winchell says:*

"In the use of the Trenton limestone quarried at Saint Paul and Minneapolis regard should be had constantly to its laminated structure. The beds quarried now are as they were originally deposited, and as cut for use embrace in every block many layers of from one-half to two inches in thickness. These consist of alternating clayey and calcareous portions, the latter constituting the hard and enduring part of the stone. These layers are not always distinct and continuous over large surfaces, but they blend or shade into each other every few inches. Yet in process of time, under natural weathering, they get separated so as to fall apart, the clayey matter disintegrating first and causing the calcareous structure which sustains the whole to break up into small sheets or fragments. Hence this stone should never be placed on edge, but in the same position it occupied in the quarry. It should never be allowed to occupy projecting or exposed parts of a building. More especially if it be on edge and in a projecting cornice or capital it is the source of weakness to the structure, as well as of danger to all passers, from the dropping of sheets or fragments as the weather, by wet or frost, separates them from each other. Its color is also against its being put in the exposed and ornamental parts of a structure. * * * The color of the Trenton makes it very suitable for foundations and for the ranges below the water-table, but even there it should be well bedded in mortar and protected by the water-table in order to keep out the water."

At Red Wing, in Goodhue County, the stone is quarried only for local building and for burning into quicklime. Blocks as large as can conveniently be handled can be obtained. At Frontenac, in the same county, the stone is of a buff or gray color, medium fine, and quite

* Preliminary Rep. on Building Stone, etc., 1889, p. 33.

cellular. This rock is considered one of the best in the State, and is used for all varieties of building purposes, as well as for bases and tombstones. Blocks 11 by 7 by 5½ feet and weighing 18 tons have been taken out, which is about as large as the quarries will furnish. It is said to work with comparative ease, and to withstand the weather well. Although having been in use longer than any other stone in the State, it has not as yet shown any change whatever from atmospheric influences. Its powers of resistance to pressure vary from 5,000 to 7,000 pounds per square inch.

At Kasota and Mendota, in Le Seuer County, the dolomite is of a buff or rusty pink color, of homogeneous texture, and very strong and durable. It withstands a pressure of 10,000 pounds per square inch without crushing. Blocks 10 by 11 feet by 1 foot in thickness can be obtained. It is quite generally used throughout the State, the pink variety being most admired and bringing the highest price.

At Mankato, in Blue Earth County, the rock is also a dolomite, buff in color, fine, compact, and semi-crystalline, sometimes cellular. Blocks 20 by 10 by 6 feet can be obtained from the quarries.

At Winona the dolomite is quarried for general building purposes, flagging, and burning into lime. It is of a buff color, usually fine and uniform in texture, though sometimes containing cherty lumps, and porous. Blocks of any size that can be handled may be taken from the quarries.

Missouri.—Limestones and dolomites of a nature unfitted for marbles, but of good quality for general building purposes, occur in great abundance in Saint Louis, Cole, Cooper, Pettis, and Jackson Counties in this State. At present, owing to the ready accessibility of a good market, the Saint Louis stone is the most extensively quarried of any of these mentioned. The stone, which is of Carboniferous age, is fine-grained and compact, and of a drab color. It is represented as strong and durable and well adapted for the manufacture of lime. At present it is used largely for foundations. A very fine-grained and compact limestone of a dark drab color occurs near Saverton, in Ralls County, which has been used to some extent for lithographic purposes. Stones from other localities are mostly compact, and of light or dull red. A very light encrinital stone is quarried in the vicinity of Hamilton and Bear Creek, in Marion County.

Nebraska.—Fine-grained, light-colored, compact, or sometimes finely fossiliferous and oolitic limestones, apparently of good quality, have been received at the Museum from near Roca, in this State. Also a light-colored fusulina-bearing stone, closely resembling that of Augusta, Kans., from Glen Rock, Nemaha County, and a fine-grained, soft, light-colored fossiliferous stone from La Platte, in Sarpy County. The writer possesses no information regarding the extent to which they have been worked, if at all.

New York.—With but few exceptions the limestones of this State con-

tain a sufficient percentage of magnesia to merit the name magnesian limestone, though scarcely enough to constitute a true dolomite. Many of the rocks belonging to this group are marbles, and have already been described.

At Greenport, Columbia County, a stratum of Lower Silurian limestone upward of 60 or 70 feet in thickness is extensively worked for ornamental and building purposes. The quarry proper is said to cover an area of 40 acres, and a face 30 feet high and half a mile in length has been opened. The stone is of medium texture, semi-crystalline, of a water-blue or gray color. The quarries at Glens Falls, on both sides of the Hudson River, furnish beside the black marble already referred to a great amount of dark-colored limestone which is used for tiling, etc., as well as burning into lime. At Willsborough and Crown Point, in Essex County, there are also extensive quarries of blue-black limestone of good quality. In various towns in Montgomery County a gray or blue-gray semi-crystalline limestone is worked for building material. The stone is said to be strong and durable, though care need to be used in its selection. At the Indian reservation in Onondaga County a gray, compact, semi-crystalline limestone, said to possess great strength and durability, was formerly extensively quarried, but the work has of late fallen off somewhat, owing to lack of transportation facilities. A gray, crinoidal stone that takes a fair polish is also found at Onondaga, in the same county.

At Lockport, in Niagara County, a fossil-bearing calcareous dolomite has been quarried for many years for general purposes of construction in New York and Rochester. The stone does not take a good surface and consequently does not polish readily, but some portions make quite showy mantels, owing to the presence of red crinoidal remains. According to Professor Julien * this stone as used in New York City has not proved durable. The fault, however, he regards in part to the manner in which the stone is used, about 40 per cent. of the blocks being set on edge.

North Carolina.—Limestones and dolomites of good quality for building purposes occur in abundance in this State, but are not extensively quarried for lack of a market or transportation facilities. Near New Berne, Craven County, there occurs a very coarse cellular shell stone of Eocene age that has been used for underpinnings and fences, but it is said not to weather well. Material of the same nature, but much finer in texture and more compact, occurs at Rocky Point, in Pender County, and which has been used in the construction of breakwaters and other harbor improvements at Wilmington, in this State. A coarse, dull red dolomite occurs at Warm Springs, in Madison County, and also light blue-gray varieties, but neither are worked, as there is little demand for the material.

* Report of Tenth Census, Vol. x, p. 369.

Ohio.—The limestones and dolomites of this State are almost altogether of a dull, uninteresting color, and though in many cases durable and strong are entirely unfit for any sort of fine building and ornamental work. They are therefore used chiefly for the rough work of foundations, street paving, and flagging, and to a very large extent for making quicklime. In many instances they have been used locally for building purposes, but their qualities are not such as to cause them to be sought from a distance.

At Point Marblehead, in the northern part of the State, dull, light-colored compact dolomites of Carboniferous age have been quarried for making lime and for building purposes for the past fifty years. Many buildings in the vicinity have been constructed from it, and it has also been largely used by the Government for light-houses and other structures along the lake front. Of late years its use for building has very considerably diminished. Near Sandusky, in Erie County, the same formations have been extensivly worked, not less than 12 acres in the vicinity having been quarried over to a depth of 8 feet. The stone is of a dull, bluish-gray color, and is used for building, flagging, and making lime; about one hundred and eighty houses in the city have been constructed from it. Near Columbus, in Franklin County, the Devonian limestones are extensively quarried, and the product has in a few instances been used for building purposes. By far the greater part of the product is, however, used as a flux for iron and for making quicklime. A dolomite from the same formations is quarried for rough building and lime burning at and near Marion, in Marion County.

In Allen, Miami, Clarke, Greene, Montgomery, Preble, and several other counties the dolomites and limestones of Upper Silurian age are extensively worked, but so far as the author can learn but a small part of the quarry product is utilized for building. At Springfield the stone is buff in color and somewhat porous, though it is said to be strong and durable.

Near Greenfield, Ross County, and Lexington, Highland County, there are extensive quarries of a bituminous dolomite, which is largely used in Cincinnati for flagging, steps, and in the manufacture of lime. Specimens received at the National Museum from the places show the stone to vary from dark grayish distinctly laminated to fine, compact, and homogeneous of a yellowish or buff color. The buff stone can be cut to a sharp edge, and acquires a good surface, but takes only a dull polish. So far as the author has observed this is one of the finest appearing and best working stones in the State.

The Montgomery County stone is a magnesian limestone, and it is said to have obtained a good reputation. It is not now used as much as formerly, however. The stone quarried in the other localities mentioned present so little diversity of character as to need no special description.

Pennsylvania.—The Lower Silurian formations in Montgomery, Lancaster, and Chester Counties, which furnish the supply of marble already referred to,* furnish also large quantities of gray or bluish-gray stone of the same composition, but, owing to its color and texture, unsuited for any form of ornamental work. It is, however, extensively quarried for general building, for foundations and bridge abutments. Besides, in Montgomery County, limestone is quarried for local use in Easton, Tuckerton, and Reading, Berks County, and in Annville, Lebanon County; also near Harrisburg, Dauphin County; Leaman Place, Lancaster County; York, York County; Bridgeport, Shiremanstown, and Carlisle, Cumberland County. The stone from the Lancaster quarries breaks with an irregular fracture; is "plucky," as the stone cutters say, and is hence hard to work. It is, however, very durable, exposure for many years having no other apparent effect than that of a slight fading of the color.

The York stone is very fine grained, compact, and of a deep blue-black color. It takes a high polish, and but for its uneven texture might make a fine marble. In Wrightsville, in this same county, a white or bluish crystalline granular stone is quarried, which takes a fair polish, and which might perhaps be used for marble.

At Chambersburg, and in other parts of Franklin County the stone is a calcareous dolomite, dark in color, fine grained, and very durable; buildings which have stood for a century showing only a slight fading. It is used locally for rough building, lime burning, and fertilizers.

At various localities near South Mountain, a limestone breccia similar to that of Frederick, Md., occurs, and which perhaps can be made to yield good stone for ornamental work.

Tennessee.—A compact, finely fossiliferous, light pink spotted limestone occurs in the vicinity of Nashville, in this State, and which is quite extensively quarried for use in the near vicinity. The stone is said to be of rather poor quality, but is used on account of its accessibility. Near Chattanooga, in Hamilton County, a magnesian limestone of bluish-black color is quarried for local use. The quarry is said to be very favorably located, and the stone cheap and very durable.

Light pink, finely fossiliferous, semicrystalline limestones occur at Columbia, Maury County; light-colored, similar-textured stones at Carter's Creek; light, almost white, at Morristown; red, compact fossiliferous at Springville; and compact drab and almost black dolomites near Charlotte Pike. A fine grained, compact, and light-colored oolitic stone occurs at Sherwood Station, which cuts to a sharp, smooth edge and seems a most excellent stone. So far as the author is aware-none of these are quarried for anything more than local use.

Texas.—Compact, fine-grained Cretaceous (?) limestones of excellent quality occur near San Saba in this State. A portion of these are

* See p. 382.

entirely crystalline and acquire an excellent surface and polish, such as fits them for interior decorative work.

Light-colored, fine-grained limestones also occur in the vicinity of Austin, in Travis County; and dark mottled varieties near Burnet, in Burnet County.

Wisconsin.—The more thickly settled portions of this State are, according to Professor Conover,* underlain by Silurian rocks so disposed that there are but few regions where rock fit for ordinary purposes of construction can not be obtained in quantities sufficient to supply the local demand. Previous to 1880, however, with a single exception, no quarries had been worked for export beyond the State, and but few that had been worked for other than local markets. As a whole the stone belonging to this class in the State are characterized by their light colors, compact textures, and hardness. Many of them will take a good polish and might be used for ornamental work, but that the colors are dull and uninteresting. Such occur and are quarried to a considerable extent at Byron, Fond du Lac, and Eden, in Fond du Lac County, but although the stone seems very durable, its hardness is such that it has not been used for facings or any kind of ornamental work. Coarse drab dolomites are quarried for general building at Ledyard and Kaukauna, in Outagamie County; at Neenah and Oshkosh, Winnebago County, and at Duck Creek Station, in Brown County. In various parts of Waukesha County there occurs a light drab, sometimes almost white, dolomite, which, though a hard stone to cut, has been quite extensively used and with very good effect for general building. At Eden, Oak Centre, and Sylvester, Green County, a similar stone occurs, which also crops out in Calumet County. Here it is of a white mottled color, takes a good polish, and is locally called marble.

Near Racine there occur beds of dolomite, varying from coarse, porous, and irregularly bedded to a fine, compact, and homogeneous rock, eminently adapted for fine building material, though not well suited for ornamental work. The quarries are very extensively worked. Other quarries in the same formation occur at Milwaukee, Cedarburgh, Grafton, Sheboygan, and Manitowoc. The Milwaukee quarries furnish several grades of building material, and of almost any necessary size. These are said to be remarkable for the great depth of excellent building stone which their working has developed.

Numerous other quarries occur in Rock, Dane, and La Crosse Counties, but which can not be mentioned here for lack of space.

* Report of Tenth Census, Vol. x.

E.—THE GRANITES AND GNEISSES.

(1) COMPOSITION AND ORIGIN.

By the term "granite" is understood a crystalline granular mixture of the minerals quartz, orthoclase, and plagioclase, which, in varying proportions, make up the chief bulk of the rock. Besides these, there is nearly always present one or more of the minerals biotite, muscovite, or hornblende, and more rarely augite, chlorite, tourmaline, graphite, and hematite. By the aid of the microscope may frequently be detected other accessory minerals such as apatite, epidote, zircon, magnetite, menaccannite, and microcline. These last, although of scientific interest, are of little practical importance.

Microscopic study of properly prepared thin sections of granite have shown that there are at least two varieties of feldspar and that they are radically different. The one is orthoclase, which is usually the predominating constituent, while the other is a triclinic variety, usually albite or oligoclase, called for convenience *plagioclase* when the exact variety can not be definitely ascertained. It is easily distinguished from the orthoclase by its beautiful banded structure as seen in polarized light. A third variety, identical in chemical composition with orthoclase, but crystallizing in the triclinic system, is also frequently present. This is microcline. Under the microscope it shows a peculiar basket-work structure, due to the nearly rectangular intersection of its laminæ produced by twin formation.

The quartz does not occur in the form of crystals, but rather in that of angular crystalline grains. It appears always fresh and glassy, but on microscopic examination is found to contain numerous inclosures, such as rutile needles and little prisms of apatite. A most interesting fact is the presence of minute cavities within the quartz, usually filled wholly or in part with a liquid, though sometimes empty. This liquid is commonly water containing various salts, as the chloride of sodium or potassium, which at times separates out in the form of minute crystals. Carbonic acid is frequently present, giving rise to a minute bubble like that of a spirit-level, and which moves from side to side of its small chamber as though endowed with life. So minute are these cavities that it has been estimated from one to ten thousand millions could be contained in a single cubic inch of space.*

Granites are massive rocks, occurring most frequently associated with the older and lower rocks of the earth's crust, sometimes interstratified with metamorphic rocks or forming the central portion of mountain chains. They are not in all cases, as was once supposed, the oldest of

* Judd on Volcanoes, p. 64.

rocks, but occur frequently in eruptive masses or bosses, invading rocks of all ages up to late Mesozoic or Tertiary times.*

They are very abundant throughout the Eastern and Northern United States and the Rocky Mountain region.

The average specific gravity of granite is 2.66, which is equal to a weight of 166½ pounds per cubic foot, or practically 2 tons per cubic yard. According to Professor Ansted† granites ordinarily contain about 0.8 per cent. of water, and are capable of absorbing some 0.2 per cent. more. In other words, a cubic yard would in its ordinary state contain 3.5 gallons of water. The crushing strength of granite is quite variable, but usually lies between 15,000 and 20,000 pounds per square inch, as will be seen by reference to the tables. The average chemical composition is as follows:

	Per cent.
Silica	72.00
Alumina	15.07
Iron peroxide	2.22
Magnesia	5.00
Lime	2.00
Potash	4.12
Soda	2.9
Loss by ignition	1.19

(2) VARIETIES OF GRANITE.

In classifying granites the varietal distinction is based upon the prevailing accessory minerals. The more common varieties are muscovite granite, biotite granite, muscovite-biotite granite, hornblende granite and hornblende-biotite granite; more rarely occur augite, epidote, tourmaline, cordierite, and chlorite granites. The variety without any accessory minerals is sometimes called *granitell*. *Protogine* is the name given to granites like those of Mount Blanc, which have talc or chlorite as the characterizing accessory. Pegmatite or graphic granite is a vein rock containing scarcely any mica, but consisting almost altogether of quartz and orthoclase. It owes its peculiar structure to the crystallization of these two ingredients in long parallel and imperfect prisms so that a cross-section shows peculiar triangular and polygonal figures comparable to the letters of the ancient Greek or Phœnician alphabets.

By far the larger proportion of the granites at present quarried in the United States have mica, either muscovite or biotite, as the characterizing accessory, and hence can be spoken of as mica granites. The amount of mica present is of considerable economic importance. It does not polish as easily as do quartz and feldspar, owing to its softness,

* Professor Whitney considers the eruptive granites of the Sierra Nevada to be Jurassic. Zirkel divides the granites described in the reports of the 40th parallel survey into three groups: (1) Those of Jurassic age; (2) those of Paleozoic age; and (3) those of Archæan age. The granites of the Eastern United States, on the other hand, are considered by geologists almost without exception as Archæan.

† Hull, Building and Ornamental Stones, p. 30.

and the presence of a large amount therefore renders the rock difficult to polish, and when polished it does not retain its luster so long as do the other minerals, its surface soon becoming dull by exposure. Its presence in large amounts is therefore deleterious to stones which are intended for exterior polished work. The condition in which the mica occurs is also an important factor. A large amount of it scattered in very fine flakes throughout the mass of the rock influences its value as a polished stone less than does the presence of large and thick crystals scattered through the rock in smaller number. The method of the arrangement of the mica is an important item; if scattered at haphazard, and lying in all directions among the quartz and feldspar crystals, the rock will work nearly as well in one direction as another. If it is scattered through the rock in such a way that its laminæ are arranged in one definite plane, it imparts a stratified appearance to the rock, causing it to split more readily in the direction of this lamination than across it. When this stratified appearance becomes strongly marked the rock is called a gneiss. Since, then, the distinction between granite and gneiss is simply one of structure, and as the two rocks are used to a considerable extent for the same purposes, they will be treated of together in the following pages.

If hornblende is the characterizing accessory, the rocks are usually without distinct lamination, as this mineral commonly exists in a granular form. Hornblende is subject to as wide variations of composition as is mica, but its white and very light colored varieties do not usually occur in our granites. Hornblende cleaves parallel to two planes, which make angles of 124° with each other, and in this respect is distinguished from black mica, which has but one cleavage. Its folia are also inelastic.

Hornblende takes an easier and more durable polish than mica and its presence is preferable on this account. Pyroxene as a characterizing accessory in granite is more common than has ordinarily been supposed. Indeed all rocks which contain pyroxene abundantly have usually been confounded with hornblende granites. The distinction between these two minerals is important from an economic stand-point, as hornblende possesses a much better cleavage than pyroxene, while the pyroxene is much more brittle than the hornblende, and cracks out with greater ease while working. The cracking out of little pieces from the black ingredient of the Quincy granites has been frequently noticed, and is due to the circumstance that this granite is not the hornblende-granite it has usually been supposed to be. Hornblende is very tough, but the Quincy granite contains a peculiar variety of pyroxene which is so brittle that it is difficult to produce a large surface which does not show some little pits, due to the breaking out of a portion of the black grains of pyroxene. Although pyroxene and hornblende may be identical in composition, they are frequently associated together in the same rock; a fact which is very evident when thin sections are examined

with the microscope, though they are indistinguishable to the naked eye. Those granites which contain hornblende also frequently contain mica, but it is noticeable under such circumstances that the mica is always the dark variety, and an example of a granite which contains both hornblende and muscovite is unknown.* Although epidote is a very common constituent of our granites in the form of microscopic crystals, the cases in which it occurs as chief accessory are quite rare. So far as observed it is always of a green color, and when present in any quantity is readily noticeable on this account alone. The pink granite of Dedham, Mass., is the most marked example of epidotic granite now quarried, though in several other cases, as the biotite-epidote gneiss of Lebanon, N. H., the mineral is frequently present in such quantities as to appear in greenish blotches on a polished surface. Tourmaline granites occur only in veins, and, so far as is known to the writer, never in sufficient abundance to warrant the opening of quarries to work them exclusively.

In texture the granites vary from extremely fine and homogeneous rocks to those in which the individual crystals are several inches in length. Porphyritic structure is common, and is produced by the development of larger crystals of orthoclase in the finer groundmass of quartz and feldspar. The color of granites is dependent largely upon the abundance and kind of accessory minerals and the color of the prevailing feldspar. Ordinarily the muscovite granites are very light gray in color, the biotite and hornblende granites light to dark gray, or sometimes almost black on a polished surface, as is the case with the hornblende-biotite granite of Saint George, Me. In the red and pink granites the color is due to the red or pink orthoclase. which is the prevailing constituent.

(3) USES OF GRANITE.

Since the earliest times granite has been used by all civilized nations for monumental and other purposes where great strength or durability was required. But while the enduring properties of the rocks have caused them to be eagerly sought, their great hardness and consequent poor working qualities have caused them to be used in works of the more simple and massive kind, where but little carving and dressing were necessary. In past ages the cheapness of life and labor in great part counter-balanced these difficulties, and hence are found works of most elaborate design executed in this refractory material; works which with the present high valuation set upon labor could never be executed but with the aid of greatly-improved machinery and methods of workmanship. The ancient Egyptians, to whom human life and labor were matters of minor importance, have left a profusion of temples, obelisks, and pyramids, whose surfaces are often carved and polished in the finest and most delicate manner, although constructed of material so obdurate

* Hawes Lith. of New Hampshire.

and unchangeable that in some cases even the marks of the tool remain upon it to the present day. A specimen of red granite now in the Museum, and formerly a portion of one of these obelisks, still shows the original carving made upon it upwards of three thousand years ago.

There is probably no country on the globe in which so large a proportion of its stone buildings are of granitic rock as the United States. This fact is due rather to the ready accessibility of the rock in those portions that were earliest settled than to any very decided preference on the part of the builder. The United States Government has of late shown a decided preference for granite in the construction of its public buildings, and has often had it transported many hundreds of miles, at a cost that never would have been undertaken by private capitalists. One item that tends to increase the cost of our granite, and other stone buildings as well, to a seemingly needless extent is the fact that American tastes seem yet incapable of appreciating any but smoothly-dressed or carved stone in a wall. This fact is, it seems to the writer, greatly to be regretted, since, with the majority of stones, better and more majestic effects can be produced by rock-faced and rubble-work than in any other manner, and at a much less cost.

Probably the most elaborate granite buildings now in the United States are the State, War, and Navy Department Buildings in Washington and the new capitol at Albany, N. Y.

(4) GRANITES OF THE VARIOUS STATES AND TERRITORIES.

California.—It is stated* that the first stone house erected in San Francisco was built of stone brought from China, and at the present day the granites most employed are brought from Scotland and the Eastern United States. However this may be, it is obvious that this condition of affairs need not long continue to exist, since granites of good quality occur in inexhaustible quantity in the near vicinity. As early as 1853 a granite quarry was opened in Sacramento County, and since then others have been opened and systematically worked in Penryn and Rocklin in Placer County. The Penryn works are some 28 miles east from Sacramento on the line of the Central Pacific Railroad. The first quarries were opened in 1864 and are now said to cover some 680 acres at Penryn and Rocklin,† the latter point being some 6 or 8 miles distant from the former in a westerly direction.

The rock varies in color from light to dark gray, one variety, which contains both hornblende and biotite, being almost black on a polished surface. They are as a rule fine grained, and take a good polish. Blocks more than 100 feet long, 50 feet wide, and 10 feet thick have been quarried out and afterwards broken up.‡

The buildings mentioned below have been constructed wholly or in

*Building Stone and Quarry Industry, Report Tenth Census, Vol. x, p. 2.

†The Rocklin stone is rather a quartz diorite than a true granite.

‡Mineral Resources of the United States, 1883, p. 455.

part of these granites: United States Mint, new City Hall, new Stock Exchange, the Real Estate Associates' building, and several private residences, and many monuments; all in San Francisco.

A fine-grained very light-gray granite of excellent appearance is found on the line of the California Southern Railroad between Los Angeles and Cucamonga, and is beginning to be used in Los Angeles. In texture it is as fine as the finest Westerly, R. I., or Manchester, Va., stone, and of a uniform light gray color. A coarser stone, carrying abundant hornblende and black mica, is found also at Sawpit Cañon, in the same county. It works readily, but contains too much hornblende, and also too many small crystals of sphene, to be of value for fine monumental work.

Colorado.—Granites are at present but little worked in Colorado, although the State contains great quantities of this material. A coarse red granite has been quarried to some extent from bowlders at Platte Cañon, Jefferson County, but the rock is poor in color and possesses but little tenacity. Fine gray granite of good quality occurs at Georgetown and Lawson, in Clear Creek County, and there are inexhaustible quantities of equally good material all through the mountains, but which are not quarried owing to the cost of transportation. A full series of them is in the Museum collection.

Connecticut.—"Extensive quarries of granite and gneiss are located at various points in this State, especially near Thomaston and Roxbury, in Litchfield County, on Long Island Sound, Fairfield County, near Ansonia, Bradford, and Stony Creek, New Haven County, Haddam, Middlesex County, and near Lyme, Mantic, Groton, and Mason's Island, New London County. The Connecticut granites and gneisses are usually fine-grained and light gray in color, and the appearance is usually so characteristic as to distinguished them from other granites of the Atlantic States."*

The most of these stones are, however, quarried only for local use, and but few find their way into markets outside of the State. A beautiful light gray muscovite-biotite granite is quarried at Thomaston and Reynolds Bridge, which for evenness of grain and clearness of color can not be excelled. The stone from Roxbury is a trifle darker, but though of fine and even grain and acquiring a good polish, is used only for curbings, foundations, and pavings. The Ansonia rock is a very fine-grained muscovite-biotite gneiss, and has been used for general building purposes in New Haven and Bridgeport. The Leetes Island and Stoney Creek rocks are of a pink color, the first mentioned being sometimes very coarsely porphyritic. A turned column of the Leetes Island rock in the Museum shows large pink orthoclase crystals 2 inches or more in length embedded in the finer gray groundmass of the rock. A beautiful and very coarsely crystalline red granite occurs near Lyme, but for some unexplained reason the stone is not in the market. It has

*Report Tenth Census, Vol. x, p. 127.

been used to some extent in Newport, R. I., and some of the material may be seen in the Chaney Memorial Church at this place. Contrary to the general rule in red granites, the feldspars of this rock are not opaque, but quite clear and transparent, and in point of beauty the rock far excels the celebrated Scotch granites from Peterhead. The Haddam, Greenwich, and Bridgeport gneisses are all hornblendic, very dark gray, and split readily in the direction of their lamination; their uses are strictly local.

Delaware.—This State produces scarcely anything in the way of granite rocks. A few quarries of a dark gray gneiss are worked near Wilmington, and are used for general building purposes in this city. One church and several private dwellings have been constructed of this stone, which belongs to the class known as *augite-hornblende* gneiss, since it contains both of these minerals in about equal proportions.

Georgia.—Although this State is known to contain inexhaustible quantities of building stones of the finest quality, but little systematic quarrying is done, and none of the rocks have more than a local reputation. A fine grade of muscovite granite, light gray in color, occurs at Stone Mountain, near Atlanta, and also a dark gray hornblendic gneiss. A hornblendic granite resembling that of Quincy, Mass., is said to occur in Oglethorpe County, though the author has never seen any of the material.

Maine.—The large extent of coast-line of the State of Maine, composed of granitic rocks of a kind suitable for building purposes, renders possible the shipment and transportation of the quarried rock at rates much lower than would otherwise be attainable, the quarries being frequently situated so near the water's edge that little, if any, handling is necessary prior to loading upon the vessel. This favorble circumstance, together with the excellent quality of the rock obtainable, led to the early opening of very numerous quarries both on the mainland and the adjacent islands, and hence at the present time are found Maine granites in very general use in nearly every city of importance in the country, even as far west as California, frequently to the almost entire exclusion of perhaps equally good material close at hand.

According to the returns furnished by the special agents in the employ of the building-stone department of the Tenth Census, there were during the census year some eighty-three quarries of various kinds of building stone in the State, situated chiefly either immediately on the coast or within easy reach of tide-water.

Of these eighty-three quarries seventy-four were of granite or gneiss. The different varieties of these stones produced may be classed under the following heads: Biotite granite, biotite-muscovite granite, hornblende granite, hornblende-biotite granite, biotite gneiss, and biotite-muscovite gneiss.

BIOTITE GRANITE.—The great majority of the Maine granites are of this kind. They vary usually from light to dark gray in color, though

pinkish and red varieties are quarried in a few instances. At Red Beach, near Calais, and at Jonesborough there is quarried a pink or reddish rock, very compact and hard, which from a simple examination with the unaided eye is seen to be composed of pink or cream-colored feldspars, smoky quartz, and a few small shreds of mica. An examination of a thin section with the microscope does not greatly increase the number of constituent minerals. The mica, which is usually of a greenish color, is very evenly disseminated throughout the rock and in very small shreds, bearing numerous inclosures of magnetite. A few small apatite crystals are as usual present, but are visible only with a microscope.

The evenness of the grain of these rocks, and the occurrence of the mica only in small amount and in minute flakes are matters of great practical importance, since they allow the production of a more perfect surface and lasting polish than would otherwise be possible. The texture of the rock is much finer than the red Scotch granite, and the color a more delicate pink. They are, in fact, the most beautiful of any of our pink or red granites now in the market, and are used very extensively for monuments, ornamental work, and general building purposes. The largest blocks ever taken out from these quarries was 7 by 7 feet and 2 feet thick. It is said, however, that blocks 30 by 15 by 2½ feet could be obtained if desired. The principal markets of the stone are Boston, Providence, New York City, Baltimore, Philadelphia, Buffalo, Cincinnati, Cleveland, and Columbus, Ohio, Springfield and Chicago, Ill., Milwaukee, Saint Louis, Charleston, S. C., Washington, D. C., and San Francisco, Cal.

At West Sullivan, in Hancock County, a light gray, sometimes slightly pinkish, granite of medium texture is extensively quarried for paving blocks and general building purposes. The stone corresponds closely with that quarried in the town of Franklin. A slightly pinkish granite of coarse texture is also quarried at Somerville, on Mt. Desert Island. This stone was used in the construction of the Brooklyn approaches to the East River bridge and in the arches and foundations of the new bridges in Back Bay Park, Boston. Blocks 150 by 50 by 18 feet have been loosened in the quarry. "The position of these quarries is peculiarly good for shipping, as they lie near the head of Somer Sound, along a narrow and very deep fiord, running several miles inland from the southwest harbor, between the mountains. One of the quarries is situated on the side of a hill and at the water's edge. The sheets of stone are very thick in some cases, one being 18 feet in thickness."

In the vicinity of East Blue Hill, in this same county, are quarried some of the most beautiful gray granites at present in the market. The rock varies from fine, even-grained gray or slightly pinkish to coarsely porphyritic. A foot cube of this granite in the National Museum is composed of a fine even-grained gray groundmass, carrying very many snow-white crystals of orthoclase an inch or more in length. This is

one of the most beautiful gray granites for monumental work with which the author is acquainted. Blocks 90 by 80 by 6 feet have been moved out in some of these quarries. Specimens of this granite tested at the Centennial Exposition at Philadelphia in 1876 showed a crushing strength of 22,000 pounds per square inch. In the quarries the stone lies in sheets from 3 to 10 feet in thickness. The principal markets are Philadelphia, New York, Chicago, Harrisburg, and Washington, D. C.

Two varieties of granite are quarried at Mount Waldo, in the town of Frankfort. Both are light-gray rocks, frequently porphyritic through large white orthoclase crystals. Both varieties are of the same mineral composition, the difference being simply one of texture, one being quite coarse and somewhat porphyritic, while the other is much finer and of more even texture. As would naturally be expected, the finer grade is the better and more durable rock, the coarser variety being more liable to crumble. The mica occurs in large flakes, which the microscope shows to be frequently pierced by small crystals of apatite. A part of the mica is greenish in color and contains a few small grains of epidote. An occasional flake of white mica was noticed in this rock, and there is present the usual sprinkling of magnetite granules, together with an occasional cube of pyrite. Quarries were opened at Mt. Waldo in 1853, and single blocks 80 by 40 by 20 feet have been taken out and afterward cut up. It is estimated that blocks 150 by 50 by 12 feet could be obtained if desired. The rock has been used largely in the building of forts on the coast of Maine, but is also used for all purposes, both ornamental and otherwise, to which granite is usually applied, and has been shipped as far South as Mobile and New Orleans. It is a beautiful stone when polished. The principal quarry is situated on Mt. Waldo, overlooking the Penobscot River, at an elevation of some 320 feet above high tide.

The quarries at Vinalhaven, in Penobscot Bay, are the most extensive of any at present in operation in this country. Quarries were first opened here about 1850, and the present annual product is upwards of 200,000 cubic feet, valued at some $110,000. Upwards of six hundred men are regularly employed at the works, though the number has at times risen as high as one thousand five hundred. The capabilities of the quarries can be best illustrated by stating that during a visit of the writer to these quarries in the summer of 1883 he was shown the remains of a huge block of granite 300 feet long, 20 feet wide, and varying from 6 to 10 feet in thickness, that had been loosened from the quarry in a single piece and afterward broken up. The largest block ever quarried and dressed was the General Wool monument, now in Troy, N. Y., which measured, when finished, 60 feet in height by 5½ feet square at the base, or only 6 feet 7 inches shorter than the Egyptian obelisk now in Central Park, New York.

In texture the Vinalhaven rock is rather coarse and the general color gray, although the prevailing feldspar is sometimes of a light flesh-

color. Besides biotite, the rock contains small amounts of hornblende and microscopic apatite and zircon crystals.* It takes a good and lasting polish, and is well adapted for all manner of ornamental work and general building purposes. The stone has been used so extensively all over the country, that to cite special cases seems superfluous.

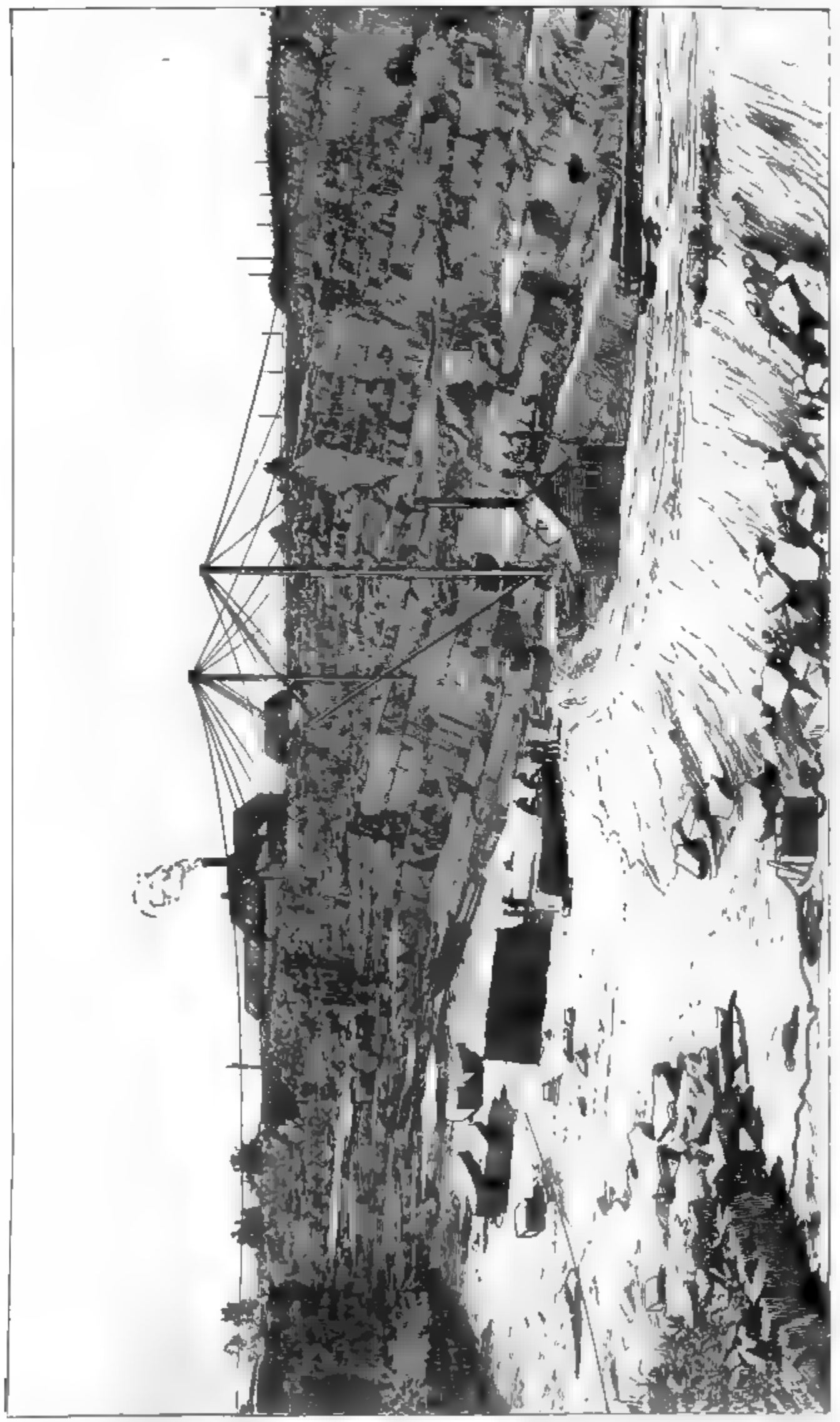
A granite closely resembling that of Vinalhaven is extensively quarried at Hurricane Island, some 3 miles distant, in a southwesterly direction, and is used for similar purposes. The structure of the stone here differs in different parts of the quarry. In one portion it lies in comparatively thin sheets, while in another there occur immense masses of solid rock, extending downward for 50 feet without perceptible jointing. A block of 80 tons has been moved, and a mass 80 by 40 by 25 feet was loosened in the quarry. Natural blocks 500 feet long, 20 feet wide, and 50 feet deep occur.

The celebrated quarries on Dix Island, in Knox County, from whence was obtained the granite for the United States Treasury building at Washington, including the monolithic columns, 31½ high by 3 feet in diameter, are at the present writing (1885) abandoned. Nearly the whole island has been quarried over and large bluffs entirely removed. The rock is rich in quartz, and therefore quite hard, but is a good and safe working stone. It has been very extensively used in New York City, Philadelphia, and Washington, D. C.

To give a special description of each and all the quarries of biotite granite to be found upon the coast would extend this work far beyond the prescribed limits. A complete list of them is to be found in the Museum catalogue.

MUSCOVITE BIOTITE GRANITES.—The granite of Augusta and Hallowell has long been justly celebrated for its beauty and fine working qualities. It is a fine, light-gray rock, the uniformity of whose texture is often broken by the presence of large white crystals of microcline, which inclose small, rounded grains of quartz. Biotite and muscovite occur in abundance, and in about equal proportions, but in small flakes, the muscovite appearing as small, silvery-white glistening particles on a broken surface of the rock. Under the microscope three feldspars are readily distinguished—orthoclase in imperfect crystals and irregular grains, an abundance of plagioclase, and microcline in large plates filled with cavities and inclosures of muscovite and quartz. In the thin sections the quartz inclosures are usually circular in outline and are pierced in every direction by minute thread-like crystals of rutile, in polarized light showing up in strong contrast with the beautiful basket-work structure of the inclosing microcline. All the feldspars are quite fresh and pure. A few apatite crystals are present, together with occa-

* In Hitchcock's "Report on the Geology and Natural History of Maine," 1862, p. 265, the Vinalhaven rock is referred to as a "peculiarly fine-grained syenite of good color," etc. In none of the specimens received at the Museum from this locality, however, does hornblende play more than a secondary part, and in the majority of cases does not appear at all. Hence all are classed as biotite-granites.



GRANITE QUARRY, HALLOWELL, MAINE.
Drawn from a photograph.

sional garnets, which in thin sections are always destitute of crystalline form, appearing as rounded or óval nearly colorless bodies traversed by many irregular lines of fracture. They are quite free from impurities, though occasionally containing inclosures of biotite. As is usual in muscovite-bearing rocks but little magnetite is present; in two cases only grains of pyrite were noticed.

This is one of the best working of the Maine granites, and is used very extensively, not only for building and monuments, but is carved into statues, like marble. The rock is properly a gneiss, but showing no signs of stratification in the hand specimen is classed here as a granite. As illustrative of the great extent of the quarries, it is stated that blocks 200 feet in length, by 40 feet in width and 8 feet in thickness, can be broken out in a single piece if so desired. There is no gap between the sheets, and little or no pyrite to cause discoloration. The sheets, as is usually the case, increase in thickness downward, being about 1 foot thick at the surface and 10 feet thick at the bottom of the present openings, which are from 50 to 60 feet deep. (See Plate VIII.)

This stone is in such demand for statuary and monumental work that an Italian designer who served his apprenticeship in Roman studios is employed constantly by the company. Many of the workmen are also said to be Italians who worked on marble in Italy, but have learned to cut granite since their arrival in Hallowell. Among the prominent structures and monuments constructed, wholly or in part, of this stone, are the new capitol, Albany, N. Y.; Bank of Northern Liberties, Philadelphia; State capitol, Augusta, Me.; Emory Block, Portland, Me.; Odd Fellows' Memorial Hall, Equitable Building, and part of the old Quincy Market, Boston; Ludlow-street jail, the Tribune building, and the old Tombs prison, New York City; the statues of the Pilgrim's Monument at Plymouth, Mass.; soldier's and sailor's monuments at Marblehead, Mass.; Portsmouth, Ohio; Augusta, Boothbay, and Gardiner, Me.; Odd Fellows' monument, Mount Hope, Boston; Washington Artillery monument and Hernandez tomb, New Orleans, etc. The statues on the Pilgrim's Monument are said to be the largest granite figures in existence. The standing figure is 38 feet in height, while the four in sitting posture are each 15 feet in height.

HORNBLENDE GRANITE.—This is rather a rare building-stone in Maine, though extensively quarried in other States. Its production is at present confined to Otter Creek, Mount Desert, where a coarse red rock is quarried, which on a superficial examination somewhat resembles the biotite granites of Calais and Jonesborough, though lacking the cream colored feldspar and consequent speckled appearance characteristic of these rocks. Orthoclase predominates over all other constituents, and is deep-red in color.

This rock is very compact and hard, but works well and takes an excellent surface and polish. It is of finer texture than the Scotch-red granites, and bears a closer resemblance to red granite of the Bay of

Fundy than to any other at present in the collection. If the specimen received at the Museum is a fair sample of the rock at the quarry, it is certainly a most excellent stone, though its otherwise uniform texture is often interrupted by the presence of oval or rounded black patches or knots, caused by segregations of mica, hornblende, and other iron-rich minerals. This is, however, a defect not uncommon in many of the Maine granites.*

Maryland.—The most noted quarries in this State are situated in Baltimore County, near Woodstock. The rock is a biotite granite, varying from light to dark gray in color, and of about medium texture. It is used extensively for general building purposes and for monumental work in Baltimore, Washington, and some of the Western States. At Mount Royal and opposite Ellicott City fine-grained dark-gray gneiss is quite extensively quarried for general building purposes, curbstones, etc. A part of this rock is beautifully porphyritic through large feldspars an inch or more in length.

A dark-gray gneiss, which is the principal stone used in Baltimore for rough work, is quarried in the immediate vicinity of the city.

At Port Deposit, in Cecil County, a gray biotite gneiss is extensively quarried, and is used chiefly for bridge building, docks, harbor improvement, and general building work. It has been used in the construction of Haverford College, Md., St. Dominick's Church, Washington, and several churches in the immediate vicinity. Other locations where good quality of granite is exposed, but not quarried to any extent, are Gwynn's Falls, in Baltimore County, and 3 miles east of Rockville, in Montgomery County.

All of the Maryland granites and gneiss at present quarried have biotite as their chief accessory, are of a gray color and of medium fineness of grain. They appear, however, better adapted for general building than for ornamental work.

Massachusetts.—As Massachusetts was the earliest settled of the New England States it is but natural that here the systematic quarrying of granite should first be undertaken. As already noted,† granite from the bowlders on the Quincy Common, and from Chelmsford began to be used in and about Boston as early as 1737, but it was not until the early part of the present century that its use became at all general. Indeed it may be said that it was not until the opening of the quarries at Quincy in 1825 that the granite industry assumed any importance. From this time the use of the stone for general building purposes increased in a marked degree, and the history of granite quarrying in the United States may properly begin with this date.

This early opening of quarries at Quincy was due largely to the demand for stone at Charlestown for building the Bunker Hill monument.

* See On the Black Patches in Maine Granite, Proc. Nat. Mus., 1883, p. 137; also, On the Collection of Maine Building Stone in the National Museum, Proc. Nat. Mus., 1883, p. 165.

† Ante p. 286.

but the attention of capitalists being thereby called to the extent of the granite ledges in this vicinity other works were soon established, and at the present time the two towns of Quincy and West Quincy contain upwards of thirty quarries. Altogether these produce not less than 700,000 cubic feet annually, and give employment to upwards of eight hundred men.

The Quincy granites are as a rule dark blue-gray in color, coarse grained, and hard. A pinkish variety is quarried to a slight extent. They are all hornblende granites, and their general appearance so characteristic that once seen they are always easily recognizable wherever met with. As already mentioned these rocks contain besides hornblende a very brittle variety of pyroxene, which makes the production of a perfect surface somewhat difficult. Nevertheless, they are very extensively used both for rough and finished work. The United States custom-houses at Boston, Mass., Providence, R. I., Mobile, Ala., Savannah, Ga., New Orleans, La., and San Francisco, Cal., are of this stone, as are also the new Masonic Temple and Ridgeway Library building, in Philadelphia. In Boston alone there are one hundred and sixty-two buildings constructed wholly or in part of this material. Its suitability for interior decorative work can not be better shown than by reference to the polished stairways and pilasters in the new city buildings at Philadelphia.

Other very extensive quarries of hornblende-granite are located at Cape Ann, in the town of Gloucester, where it is stated * that quarrying was commenced as early as 1824 by a Mr. Bates, of Quincy. The largest quarries in the State, and, with the exception of those at Vinalhaven, Me., the largest works now in operation in the United States, are situated at this place. Like that of Quincy the rock is hornblendic, though frequently considerable black mica is present.† The texture is coarse and the color greenish, owing to the orthoclase it contains. Some varieties are, however, simply gray. It is a hard, tough rock, eminently durable, and well suited for all manner of general building and ornamental work. The stone has been used in the construction of the post-office and several churches and private buildings in Boston, and the Butler house on Capitol Hill at Washington.

Other hornblendic granites, somewhat similar in appearance, are quarried at Rockport, Peabody, Wyoma, Lynn, and Lynnfield, all of which are represented in the Museum collection. The Rockport stone is the most important of these, and has been quarried since 1830. In color and texture it is indistinguishable from much of the Gloucester stone, but, if anything, is of a more decided greenish hue. In the quarries it is extremely massive, and blocks 100 feet long by 50 feet wide and 16

* History of Gloucester, Cape Ann, by J. J. Babson, p. 577.

† The black mica of the Gloucester and Rockport granites has been shown by Professors Dana and Cooke to be lepidomelane or anuite. (Text book of Mineralogy, p. 313).

feet thick have been loosened from the bed in a single piece, while it is estimated a block 200 feet long 50 feet wide and 20 feet thick could be obtained if desired. The principal markets are New York, Boston, New Orleans, and Cuba.

Biotite granites.—Several important quarries of coarse biotite granite are worked in this State, but their product is mostly used in the near vicinity. Light pink varieties admirably adapted for rock-faced work occur at Brockton, Milford, and North Easton. The Milford stone, though not extensively quarried, is particularly effective when used in this manner, as is well illustrated in the new city hall at Albany, N. Y., and also in the new railway station at Auburndale, Mass. At Framingham, Leominster, Fitchburgh, Clinton, Fall River, and Freetown are also quarries of coarse gray but apparently strong and durable granites of this class.

Epidote granite.—This is a rare variety of granite in this country, the quarries at Dedham producing all that is now upon the market. The stone is fine-grained and of a light pink color. Besides epidote, which is visible to the naked eye as small greenish specks, it contains numerous flecks of chlorite, resulting from the alteration of a black mica. The stone works readily and gives very pleasing effects either in polished or rock-face work. It is of this stone that was constructed the new Trinity Church in Boston, and which is considered by good authorities to be, from an architectural standpoint, the finest building in America.

Gneiss.—A fine-grained very light gray, sometimes pinkish, muscovite gneiss of excellent quality has been quarried more or less for the past thirty-five years near the town of Westford. Other quarries of gneiss are at West Andover, Lawrence, Lowell, Ayer, several towns in Worcester County, at Becket, Northfield, and Monson, as will be noted in the tables.

Being in most cases distinctly stratified, these gneisses are not adapted to so wide a range of application as the massive granites, but at the same time the ease with which in many cases they can be quarried makes them particularly valuable for foundations, bridge abutments, curbing, paving, and rock-faced building. At the Monson quarries, for instance, the rock is divided by a series of joints, approximately parallel to the surface of the hill on which the quarries are situated, into immense lenticular sheets from 6 inches to 10 feet in thicknes. By taking advantage of these natural facilities a block was split out in 1869 which measured 354 feet in length by 11 feet in width and 4 feet in thickness. An analysis of the Monson stone from the Flynt quarry is given in the tables.

As a general rule it may be stated that while the granites and gneisses of Massachusetts are good and safeworking stones they are coarse and in no way remarkable for their beauty. In the matter of color and texture they bear a striking contrast to the fine and even grained stones of her sister States, Connecticut and Rhode Island.

Minnesota.—According to Professor Winchell more than half the State of Minnesota is underlaid by that general class of rocks—the crystalline—to which granite belongs. In the northern part of the State there are large exposures of very fine light-colored granites, but being beyond the limits of settlements and roads those in the southern and western part, in the country bordering along the Mississippi and Minnesota Rivers, are of more especial interest and importance. These last have been somewhat quarried and the materials can be seen in some of the principal buildings in various parts of the State, as well as in cities beyond the State limits. The first quarry in these rocks in Minnesota was that now owned by Breen & Young, at East Saint Cloud, Sherburne County.

This was opened in 1868, and the stone first taken out was used in the corners, steps, and trimmings of the United States custom-house and post-office in Saint Paul. Three kinds of stone were taken out and used indiscriminately, and all of them may be seen in the building first erected. The variety now more generally used is of a gray color and uniform texture. The crystalline grains are rather fine, so that the texture is close. The color, however, is sometimes disturbed by the appearance of greenish spots of the size of butternuts or even as large as 6 inches in diameter, caused by segregations of a green chlorite. "About one-third of the whole rock is made up of quartz, and two-thirds of the remainder of orthoclase. About one-half the remainder is hornblende and the residue is divided between the other minerals, the chlorite predominating." An occasional grain of a triclinic feldspar is present together with magnetite and pyrite in minute crystals.†

"The red granite from East Saint Cloud is not very different from the foregoing, but the feldspar is mainly flesh red and all the grains are coarser." It also has a higher per cent. of silica, a fact that has been discovered practically by the owners, who had given up the general use of it because of it being more costly to work. "* * * In the winter of 1874–5 a block weighing ten tons was taken out of the red-granite quarry, about 3 miles west of Saint Cloud, for a monument base. * * * It was very fine, and greatly resembled the Scotch granite in color, grain, and polish. At the point where this was taken out the granite rises about 20 feet above the general surface and spreads over more than an acre. A similar red granite occurs at Watab (in Benton County), and has furnished several handsome monuments." A light-gray granite also occurs here.*

At Sauk Rapids, in the same county, there is found a fine-grained gray granite closely resembling the gray variety from East Saint Cloud.

* See Geol. and Natural Hist. Survey of Minnesota, Vol. I, pages 142–148.

† These rocks are designated in Professor Winchell's report above referred to as "Syenites." According to the system of classification now generally adopted, they are rather hornblendic or hornblende-biotite granites, as designated by the author in the census report, p. 90. The name *syenite*, as already noted, is applied to a quartzless rock (see pp. 308 and 430).

It has been quite generally used, and is one of the best-known granites in the State.

Missouri.—Although there are inexhaustible quantities of granite in the northern part of Iron and Madison Counties and the southern portion of Saint Francois, there are but few quarries of the material systematically worked.

At Graniteville, Iron County, and in Syenite, Saint Francois County, there occurs a coarse red granite, quite poor in mica, which is now extensively quarried for the Saint Louis and Chicago markets. It is somewhat lighter in color than the well known Scotch granite, but is admirably suited for massive structural purposes, as is well illustrated in the lower stories of the fine business blocks erected during the season of 1886 on Adams street, between Fifth avenue and Franklin, and on the corner of Adams and La Salle streets, in Chicago. The enormous blocks of rock-faced granite and large polished columns of this stone as here displayed* would indicate that this is destined to be one of the leading granites of this portion of the country. It admits of a high lustrous polish and is coming into use for monumental work.

Montana.—There is a plenty of good granite within the limits of the Territory, but for lack of a market scarcely any quarrying is at present carried on.

A cube of a fine-grained light-gray biotite granite was received at the National Museum from Lewis and Clark Counties, but so far as the writer is aware the quarry has never been worked to any extent. A coarse hornblende-mica granite of a greenish-gray color and somewhat resembling the celebrated Quincy and Gloucester (Massachusetts) stone forms the country rock in the region of the celebrated silver and copper mines of Butte, and is beginning to be used for purposes of heavy foundation and general building. So far as the writer was able to judge, from the short time he was on the ground, the rock is of excellent quality, but needs to be selected with care, as certain portions, those in proximity to the ore veins, are abundantly charged with pyrite, which oxidizes readily on exposure.

New Hampshire.—Although New Hampshire is popularly known as the "Granite State," in value of total product of the material it ranks but fifth in the list of New England States, being preceded by Maine, Massachusetts, Connecticut, and Rhode Island. However this may be there are but few of our building stone that have a wider reputation than the fine light-gray muscovite-biotite granites from quarries near Concord.

* The window-sills in the first of the above-mentioned buildings are rough blocks of granite, each 3 feet square by 17 feet 4 inches long, and weighing about 10 tons each. The polished columns of the building corner of Adams and La Salle streets are ten in number, each 18 feet high by 4½ feet in diameter, and weighing not far from 18 tons. The largest single block of polished granite yet produced at these works is the Allen monument, in Saint Louis, which is 42 feet in height by 4½ feet square at the base. The weight is about 45 tons.

These rocks have been quarried for many years and very extensively used for all manner of constructive purposes. The following list includes some of the more important buildings and monuments made wholly or in part from this material: Charter Oak Insurance Building, Hartford, Conn.; soldiers' monument, at Manchester, N. H.; monument to the discoverer of anesthetics; the Germania Savings Bank; Equitable Life Insurance; Masonic Temple; Massachusetts State prison, and some seventy-five other buildings in Boston, and Booth's Theater in New York.

According to Professor Hitchcock, the more important quarries are situated on what is known as Rattlesnake Hill, an elevation some 600 feet above the level of the Merrimac River, and which consists almost entirely of granite rocks. Other granites of this class occur and are quarried at Allentown, Sunapee, and Peterborough, and are used for similar purposes, though they are not widely known outside of New England. Gray biotite granites of good quality are quarried at Mason, Fitzwilliam, Rumney, Hanover, Portsmouth, and other towns, as noticed in the tables.

The Peterborough, Mason, and Fitzwilliam are exported to some extent to the neighboring States, but the others mentioned are used in the near vicinity.

The New Hampshire granites are nearly without exception of fine and even grain and well adapted for all kinds of work. The Concord rock is practically identical both in general appearance and mineral composition with that of Hallowell, Maine, already described.

New York.—This State, although rich in marbles, limestones, and sandstones, produces little of general interest in the way of granite rock. A coarse, gray biotite gneiss is quarried at Hastings-upon-Hudson, in Westchester County; a somewhat darker hornblendic gneiss at Cold Spring, in Putnam County; and a coarse red hornblendic granite at Clayton, in Jefferson County.

The gneisses are quarried chiefly for the rough work of foundations in the vicinity. The red granite from Grindstone Island (Clayton post-office) is a beautiful stone and takes a fine polish. The sample forwarded to the National Museum, however, contains particles of iron pyrite, which unfit it for monumental work. The present product of the quarry is made into paving blocks and monuments, principally for Chicago, Ill., and Montreal, Canada, though two beautiful columns of it are to be seen in the new capitol building at Albany, N. Y.

New Jersey.—Aside from a single quarry of greenish-gray gneiss at Dover, Morris County, in this State, no granitic or gneissic rocks are anywhere regularly worked within the State limits. But "Gneissic rocks are found in a few localities in thick beds and so jointed that large and regular blocks can be quarried out at a comparatively small cost. Of the quarries that have been opened and worked to any extent that at Dover alone is kept steadily in operation. It furnishes a large

amount of stone annually for railroad construction along the line of the Delaware, Lackawanna and Western Railroad. The same rock occurs along the New York, Ontario, and Western Railroad from Pompton to Franklin, and at several points its outcrops have been opened for stone. The Sussex and Central Railroad lines also cross the rock. A large quarry was opened a few years ago near Franklin, on the mountain east of the village, but the place, though promising, was soon abandoned. The stone was adapted for heavy work. The transportation appeared to be too expensive for it to compete with stone coming by water routes."*

Pennsylvania.—Although ranking as second in importance in the list of stone-producing States, Pennsylvania furnishes very little in the way of granitic rock, and absolutely nothing in this line of more than local interest. "The southern gneissic district, described in the geological reports of Pennsylvania as ranging from the Delaware River at Trenton to the Susquehanna, south of the State line and lying south of the limestone valley of Montgomery, is the district in which are located nearly all the quarries of gneiss in the State, and those furnishing most of the material are in the vicinity of Philadelphia." The rock, which is for the most part a dark-gray hornblende gneiss, is quarried at Rittenhousetown, Twenty-first ward, and Germantown, Twenty-second ward, and Jenkinstown, in Montgomery County, and is used principally for the rough work of foundations in the near vicinity. In Chester, Delaware County, the gneiss bears mica in place of hornblende and is, as a rule, lighter in color. The quarries are in close proximity to the Delaware River, which affords an easy method of transportation to Philadelphia, the principal market. This stone is also used almost wholly for foundations, though in some cases it has been used as rock-faced work in the fronts of private dwellings, with rather a pleasing effect.

Rhode Island.—The granites of this State are nearly all fine-grained light gray or pink biotite granites, the principal quarries of which are situated some 2 miles east from Westerly, in Washington County. The rock is of fine and even texture and of excellent quality, and is much used for monumental work and general building. Other quarries of biotite granite occur at Smithfield, West Greenwich, Newport, and Niantic. A greenish, fine gray, hornblendic gneiss is quarried at Diamond Hill, in Providence County. Aside from the Westerly rock the most of this material is for local market only.

Tennessee.—At the present time scarcely anything in the line of granitic rock is quarried in this State, and owing to the limited areas occupied by granite ledges it is more than doubtful if the granite quarrying ever assumes any great importance. Small outcrops of granite, gneiss, or mica schist occur in the extreme eastern and southern parts of Polk, Monroe, Cocke, Washington, Carter, and Johnson Counties, in the eastern part of the State, but even these are not in all cases suitable for

* Ann. Rep. of State Geologist of New Jersey, 1886, pp. 41–42.

any but the roughest work. The Museum collections contain an extremely coarse greenish epidotic granite, with large red porphyritic crystals of orthoclase, from Bench Mountain, in Cocke County, which might perhaps be worked if there were a market.

South Carolina.—Although no granites from this State are to be found in our principal markets, it by no means follows that there is any deficiency in the supply. The collection now in the Museum shows, on the contrary, that excellent stones of this class occur in various localities.

Near Winnsborough, in Fairfield County, quarries have recently been opened which furnish fine-grained gray biotite granite fully equal to any in the market. The quarries, as we are informed by the owner, Mr. W. Woodward, cover some 70 acres of bowlders and two large ledges, one 11 acres in extent and the other 6. The stone works readily and acquires an excellent polish. A pinkish granite also occurs in this same county. Other granites in this State, of which we have seen specimens, but concerning which we have but little accurate information, occur near Columbia, Richland County; and in Newberry, Lexington, Edgefield, and Aiken Counties. The Columbia stone is of a light-gray color, apparently of excellent quality. It was used in the construction of the State house in that city, and is stated to be very durable.*

Texas.—Red granites, both coarse and fine, occur in Burnet County, in this State, though at present neither are quarried to any extent. Both varieties carry biotite as the chief accessory mineral. The coarser variety corresponds closely with the coarse red granite from Platte Cañon, Colo. Their colors are dull and they seem better adapted for rough building than for monumental work.

Utah Territory.—A coarse, light-gray granite occurs in inexhaustible quantities in Little Cottonwood Cañon, not far from Salt Lake City. So far the stone has been quarried only from bowlders that have been rolled down the cañon, and the parent ledge remains untouched. This stone has been used in the construction of the new Mormon temple at Salt Lake City.

Vermont.—This State furnishes but little in the way of granitic rocks, from the fact that few of her quarries produce material not found elsewhere in New England, where there are better and cheaper facilities for transportation. Quarries of biotite granite of fine grain and a gray color are, however, worked at Barre, Brunswick, Morgan, Ryegate, and Woodbury. A very light, almost white, muscovite granite is also quarried at Bethel. The most of these rocks are for local use only, though that from Brunswick is said to be carried to some extent into the neighboring cities in New York State.

Wyoming.—"The only building stone which is quarried in Wyoming is at Sherman, the highest point of the Northern Pacific Railroad. At this point—the summit of the Black Hills—the road cuts through a heavy

* South Carolina, Resources, Population, etc., 1883, p. 609.

body of red granite similar to the Scotch, but with much larger crystals." This stone has been used to some extent in San Francisco and Sacramento, but is hard to work, owing to its coarseness and lack of tenacity.*

Virginia.—The granites of this State are, as a rule, fine-grained, biotite-bearing rocks, and of a light-gray color. They correspond in a remarkable degree with the granites of New England, more so than those of any Southern or Western State. The principal quarries, thus far developed are in Chesterfield and Henrico Counties on the James River, and within easy reach of the Richmond market.

The quarry of the Richmond Granite Company, on the Richmond and Alleghany Railroad, near Richmond, produces a massive gray granite used for general building purposes, paving stone, and monumental work, and which is shipped more or less to all the States and cities south of New England and as far west as Nebraska. Much of the material is dressed at the quarry, polishing works being located on the ground.

The Old Dominion Granite Company and the Westham Granite Company, in Chesterfield County, produce a very similar stone, the principal markets of which are in Richmond, Washington, Norfolk, Lynchburgh, and Philadelphia. Other important quarries are in the Tuckahoe district, Henrico County, and Namozine district, Dinwiddie County. Stone from the last-named locality was used in the construction of the post-office and custom-house at Petersburgh, Va. The most important building yet constructed of the Virginia granites is the State, War, and Navy building in Washington, which is probably the most elaborate granite structure in the country. Near Fredericksburgh is found a fine light-gray muscovite-biotite granite closely resembling those of Hallowell, Me., and Concord, N. H., but it is not at present quarried to any extent.

Wisconsin.—The extensive outcrops of granite rock in this State have been scarcely at all worked up to the present time, owing to the lack of transportation facilities. At the present writing the most important quarries are at Montello, Marquette County, and Wausau, Marathon County. The Montello rock is very fine grained, compact, and of a dull pink color. Quarries were first opened here to furnish paving stones for the Chicago market, but the stone has since been used to a considerable extent for general building and monumental work.

According to Prof. T. C. Chamberlain† the great Laurentian area of the northern part of the State is occupied largely by granite and gneiss, among which are some of exceptional excellence. Granite rocks of greater or less excellence crop out along the upper reaches and tributaries of the Menominee, the Peshtigo, the Oconto, the Wolf, the Wisconsin, the Yellow, the Black, the Chippewa, the Flambeau, the Bad, and the Montreal Rivers. These are now being brought within the reach of cheap transportation, and should be utilized to the mutual benefit of those who work and those who use.

* *Report Tenth Census*, Vol. X, p. 278. † Geology of Wisconsin, Vol. I, p. 66.

F.—THE PORPHYRIES, PORPHYRITIC FELSITE.

(1) COMPOSITION AND ORIGIN.

Popularly any fine-grained, compact rock, carrying larger crystals scattered throughout its mass is called a porphyry, whatever may be its composition. In the present work the term has been restricted to those acid eruptive rocks of pre-Tertiary origin, consisting of a very compact felsitic base formed of an intimate mixture of quartz and feldspar and in which one or both of these minerals are porphyritically developed. The groundmass is usually too fine to allow a determination of its composition by the unaided eye, and under the microscope is found to possess that peculiar felt-like structure called by lithologists microfelsitic. The porphyritic crystals are usually of a different color from the groundmass in which they are imbedded, and hence produce the striking effect which has made these rocks so famous in all ages and caused them to be used in the finest ornamentations in spite of their hardness.

(2) VARIETIES OF PORPHYRY.

Accordingly as the porphyries vary in mineral composition they are divided into two principal varieties: (1) Quartz porphyry, which consists of the fine-grained groundmass in which quartz alone or quartz and orthoclase are porphyritically developed, and (2) quartz-free or orthoclase porphyry, in which orthoclase alone prevails, no quartz appearing either porphyritically or in the groundmass. This last variety, it will be seen, bears the same relation to the quartz porphyries as does syenite to the granites. Through an entire disappearance of the porphyritic crystals, the rock passes into felsite. The porphyries bear the same accessory minerals (hornblende, mica, etc.), as do the granites, but these are usually in such small particles as to be invisible to the naked eye.

Porphyries, like granites, are of a variety of colors; red, purple, gray, green, brown, and black of a variety of shades are not uncommon, and when, as is so often the case, the porphyritic minerals contrast in color in a marked degree with the groundmass, the effect on a polished surface is very beautiful.

(3) USE OF PORPHYRY.

The porphyries are as a rule intensely hard and tough and completely without rift in any direction. As a consequence they are scarcely at all used in this country, although among the most beautiful and indestructible of our rocks. The celebrated porphyries of Elfdalen, Sweden, are wrought into a variety of objects of art, and with exceedingly beautiful effects. Visitors at the Centennial Exposition in Philadelphia will recall the beautiful large column and inlaid table of this stone that was there displayed.

(4) PORPHYRIES OF THE VARIOUS STATES AND TERRITORIES.

Inexhaustible quantities of porphyries of a variety of colors and great beauty occur at Saugus, Malden, Lynn, and Marblehead, and other localities in eastern Massachusetts, but which have never been utilized to any extent owing to the cost of working. Many of these are of exceptional beauty, presenting colors red as jasper, through all shades of pink, gray, and even black, often beautifully variegated and brecciated in a variety of colors. Flow structures caused by the onward flowing of the rock while in a partially cooled condition often gives rise to a beautiful banding and interweaving of colors impossible to describe, and which must be seen to be appreciated. The striking beauty of this flow structure is sometimes heightened by the presence of angular fragments of variously colored portions of the rock, which, becoming broken from the parent mass, have been imbedded in a matrix of quite different color, as at Hingham, where we have found bright red fragments imbedded in a yellowish paste. The rock acquires a beautiful polish, and the fact that it has not ere this come into more general use is a sad comment upon the taste of our wealthier citizens. Nearly as indestructible as glass, and as beautiful as an agate, and yet almost wholly ignored except for purposes of rough construction.

A large variety of porphyries, varying in color from black to red, occurs also in New Hampshire, particularly near Waterville, some of which would make fine ornamental stones. At Franconia, in the White Mountains, there occurs a porphyry conglomerate formed of fragments of jasper red porphyry closely cemented into a compact rock, which is particularly beautiful. Slabs of this stone in the National Museum can not be excelled for richness of color.

Porphyries are abundant in many other States, but are scarcely at all used. Maine, Pennsylvania, Missouri, Minnesota, and Wisconsin all contain good material, though, as little or no search has been made for the highly ornamental varieties, it is impossible to say what they can produce.

At Green Lake, in the last named State, there occurs a beautiful stone of this class, almost black in color, with white porphyritic feldspars. It has been quarried to some extent near the town of Uttuy, and polished columns of it may be seen in the German-American Bank building and Union Depot at Saint Paul, Minn. It is greatly to be regretted that no economic method of working so beautiful and durable a material has as yet been discovered.

Near Charlotte, in Mecklenburgh County, N. C., there occurs a very light colored, almost white, quartz porphyry, which is penetrated by long parallel streaks or pencils of a dead black color. These are so arranged that, when cut across, the surface appears studded thickly with roundish and very irregular black points of all sizes up to half an inch. Cut parallel with the direction of the pencils, the surface is streaked

with black lines, which sometimes assume the most beautiful fern-like or dendritic forms imaginable.

The rock is intensely hard, tough, and without definite rift. It can therefore be worked only at great cost, and is not regularly quarried. It has been used only locally for rough purposes, as for curbing, steps, and sills. An analysis of this rock is given in the tables.

G. THE LIPARITES.

(1) ADAPTABILITY FOR CONSTRUCTIVE PURPOSES.

Tertiary and post-Tertiary rocks of any kind are at present very little used for constructive purposes in the United States, owing, in the case of fragmental rocks, to their state of imperfect consolidation and consequent feeble tenacity, and in the case of eruptives to their almost entire absence in those portions of the country that have become permanently settled and where as a consequence there has arisen a demand for a more durable building material than wood. Of the eruptive rocks of this class only the liparites, andesites, and basalts have been at all utilized and these to but a small extent. Their textures are, as a rule, such as to fit them only for the rougher kinds of construction, since, with the exception of the glassy varieties, they will not polish, and their rough appearance unfits them for any kind of interior decorative work.

(2) MINERAL AND CHEMICAL COMPOSITION OF LIPARITE.

Under the head of liparites are classed those acid eruptive rocks consisting chiefly of quartz and sanidin (the glassy variety of orthoclase) which are not older than Tertiary and which may be regarded as the younger equivalents of the granites, quartz porphyries, and felsite pitchstones.

In texture they vary from coarsely granitoid rocks, entirely crystalline throughout, through all intermediate felsitic stages to clear glassy forms. Structurally they vary from fine, compact, even-grained to coarsely porphyritic, amygdaloidal, and sperulitic forms; well marked fluidal structure is common. The prevailing colors are chalky white to dark gray; more rarely greenish, brownish, yellowish, and reddish varieties occur.

The average chemical composition of liparite (quartz-trachyte) as given by Zirkel is silica, 76.36; alumina, 11.97; iron oxides, 2.01; lime, 1.09; magnesia, 0.56; potash, 3.70; soda, 4.53; specific gravity, 2.55.

(3) VARIETIES OF LIPARITES.

According as they are crystalline throughout, felsitic and porphyritic or entirely glassy, liparites are classified as (1) granitic liparites or *neradites*, (2) *rhyolites*, and (3) glassy liparites as *obsidian*, *pumice*, *pearlite*, and *pitchstone*. Of these only the felsitic and porphyritic variety *rhyolite* is now quarried.

(4) LIPARITES OF THE VARIOUS STATES AND TERRITORIES.

Near Mokelumne Hill, in Calaveras County, Cal., rhyolite occurs in several different colors, and has been quarried to some extent for use in the immediate vicinity. It is also abundant in Colorado, New Mexico, Nevada, Utah, and other of the Western States and Territories.

The glassy variety of rhyolite called obsidian is very abundant in certain parts of the West, and though as yet no attempt has been made to utilize the material there would seem no good reason for its not being used in small pieces for the finer kinds of decorative work. The rock, which is a natural glass formed by the rapid cooling of a molten mass, is of various colors, black, red, and greenish, and often beautifully spotted and streaked. From the Yellowstone National Park, Glass Butte, Oregon, and other sources, the Museum has received specimens of red obsidian spotted and streaked with black wavy lines in a way that is highly ornamental. The stone occurs naturally in a badly jointed condition and could be obtained only in pieces of small size. Owing to its glassy fracture also it could be worked only with plain flat surfaces, but as it takes a high glass-like polish, it would be very desirable for tops of small stands, paper-weights, and inlaid work.

II.—THE SYENITES, TRACHYTES, AND PHONOLITES.

(1) DEFINITION OF SYENITE.

Under the name of Syenites are here included those rocks consisting essentially of orthoclase with or without one or more of the accessory minerals, mica, hornblende, or augite. They differ from granites only in the absence of quartz, and otherwise present a precisely parallel series. Thus we may have mica syenite (minette), hornblende syenite, augite syenite, etc.*

(2) LOCALITIES OF SYENITE.

At the present time syenites are but little quarried in this country, though there would seem to be no lack of material and of good quality.

In and about Portland, Me., there occur in the glacial drift many bowlders of a beautiful syenite, the exact source of which is not known to the author, but which can not be far to the northward. The rock consists mainly of bright lustrous gray orthoclase and coal-black hornblende, with occasionally a little black mica. In texture it is not too

* Formerly it was customary to call by the name syenite a rock consisting of quartz hornblende, and orthoclase, or what is now called a hornblende granite. The name takes its origin from Syene, Egypt, where a rock supposed to answer this description was originally quarried. Investigation has, however, shown that the Syene rock contains more mica than hornblende, and hence at best can not be classed as a true syenite even according to the old definition. According to recent lithologists the Syene rock is a hornblende mica granite, while true syenite, as above stated, is a quartzless rock.

coarse, and the contrast of colors such that one can scarcely imagine a more beautiful stone for rock-faced work. It is very tough, and, to judge from the bowlders, is also very durable, and not at all liable to discoloration on exposure.

Hawes* describes augite syenites as occurring in Jackson, Columbia, and on Little Ascuntney Mountain, in New Hampshire; also hornblende syenites as occurring at Red Hill and Moultonborough, Columbia, Sandwich, Stark, and Albany, in the same State. Dr. Wadsworth† also mentions a syenite as occurring in eastern Massachusetts, where it occupies a large proportion of the coast line between Salem and Manchester. None of these are as yet quarried.

Near Hot Springs, in Arkansas, there is quarried under the name of granite a tough gray rock of variable texture, consisting mainly of hornblende and elæolite, and which would therefore be classed as an elæolite syenite. Some portions of the rock, as shown by the large block in the Museum collection, are fine-grained and homogeneous, while in others the elæolite crystals reach some 2 or 3 inches in length. The appearance of the stone is excellent, but portions of it contain a large amount of pyrite and it needs to be selected with care if designed for exterior or highly ornamental work.

A syenitic rock bearing abundant elæolite and frequently cancrinite and sodalite, and which must, therefore, also be classed as an elæolite syenite occurs abundantly in the vicinity of Litchfield, Me., and specimens of the rock have found their way into the building-stone collections of the Museum. An examination of the rock does not, however, impress one particularly in its favor. Its durability is, to say the least, doubtful, and its varying texture and colors rather against it.

(3) THE TRACHYTES AND PHONOLITES.

Under the name of trachytes are comprehended by Rosenbusch those massive Tertiary and post Tertiary rocks consisting essentially of sanidin and hornblende, augite or black mica, and which may be regarded as the younger equivalents of the syenites and quartz free porphyries.

The average chemical composition is silica, 63.55; alumina, 18.0; iron oxide, 6.15; lime, 1.96; magnesia, 0.88; specific gravity, 2.65.

In structure trachytes are rarely granular but usually possess a fine scaly or micro-felsitic groundmass, rendered porphyritic by the development of scattering crystals of sanidin, hornblende, augite, or black mica. The texture is porous and possesses a characteristic roughness to the touch; hence its name from the Greek word τραχυς rough. The prevailing colors are gray, yellowish or reddish.

Trachytes are volcanic rocks occurring in eruptive masses in dikes and in lava flows. They may be divided into hornblende, biotite, or

* Geol. of New Hampshire, Vol. III, Part IV, p. 205.

† Geol. Mag., May, 1885, p. 207.

augite trachytes, according as either of these accessory minerals predominates.

Phonolites differ from trachytes in carrying one or both of the minerals nepheline or leucite in addition to the other constituents named. They bear the same relations then to the trachytes as do the elæolite syenites to the syenites proper.

Neither trachytes nor phonolites are, so far as now known, common rocks in the United States. Zirkel * describes numerous trachytes from the areas covered by the Fortieth Parallel survey, and Caswell † describes both trachytes and phonolites from the Black Hills, Dakota. Recent investigations by Wadsworth ‡ and Messrs. Hague and Iddings § show, however, that the supposed trachytes of Zirkel were in large part if not altogether andesites, and it is very probable that similar tests applied to many other cases heretofore described would be productive of similar results. However this may be, the utility of the rocks in America is purely prospective.

Their colors and textures are such that they can never be used for other purposes than rough construction, as is the case with the majority of the younger eruptives.

I.—AUGITE (ENSTATITE, HYPERSTHENE) PLAGIOCLASE ROCKS.

(1) DIABASE.

(Diabase, from the Greek word διαβυσις, to pass over; so called because the rock passes by imperceptible gradations into diorite.)

The diabases are entirely crystalline granular rocks, composed essentially of plagioclase feldspar and augite, with nearly always magnetite and frequently olivine. Geologically they are pre-Tertiary eruptive rocks, basic in composition, occurring in dikes, intruded sheets, and lava flows. Their mode of occurrence is quite similar to that of basalt, from which they differ chiefly in date of eruption and the amount of alteration they have undergone. In structure they are as a rule massive, but schistose varieties occur and more rarely spherulitic forms. The texture is as a rule fine, compact, and homogeneous, though sometimes porphyritic or amygdaloidal. The colors are somber, varying from greenish through dark gray to nearly black, or sometimes black when freshly quarried, but becoming greenish on drying. ‖

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* Micro. Petrography, fortieth parallel.

† Geol. Black Hills of Dakota.

‡ Proc. Bos. Soc. Nat. Hist., Vol. XXI, 1881, p. 243, and Vol. XXII, 1883, p. 412.

§ Am. Jour. Sci., Vol. XXVII, 1884, p. 453.

‖ Mr. J. P. Iddings suggests that the change in color from dark, blue black, and greenish, as noticed in diabase of New Jersey, is due to the drying of the serpentine or chlorite, which results from the alteration of the included olivine. (Am. Jour. Sci., May, 1886, p. 330.)

According to Zirkel, the average chemical composition of diabase is as follows:

	Per cent.
Silica	49.54
Alumina	14.05
Iron protoxide	14.27
Lime	8.20
Magnesia	5.28
Potash	1.16
Soda	3.88
Water	2.29

Average specific gravity, 2.8, equal to a weight of 175 pounds per cubic foot.

In classification two principal varieties of diabase are recognized, the distinction being founded upon the presence or absence of the mineral olivine. We thus have (1) olivine diabase, or diabase with olivine, and (2) diabase proper, or diabase without olivine.

Owing to its lack of definite rift, compact texture, and hardness, diabase can, as a rule, be worked only with difficulty and usually at a cost considerably greater than that of granite. It is therefore not extensively quarried, though of late years it has come into more general use for paving purposes, and still more recently for building and monumental work. The green *antique porphyry* or *Marmor Lacedæmonium viride*, formerly much used for pavements and general inlaid decorative work in Greece and Rome, is, according to Delesse,* a diabase consisting of large greenish crystals of labradorite embedded in a fine compact ground mass of the same feldspar, together with augite and titaniferous iron. The quarries from which the stone was taken are stated by Hull† to be situated between Sparta and Marathon, in Greece. A stone of a similar character and closely resembling it in color and structure is abundant among the drift bowlders of eastern Massachusetts, but its exact derivation is unknown.

In the eastern United States the dikes of diabase are frequently associated with deposits of red or brown Triassic sandstone, which are also extensively quarried, as will be noticed further on. Concerning these dikes Professor Dana writes:‡

"It is remarkable that these fractures (through which the diabase was forced to the surface) should have taken place in great numbers just where the Triassic beds exist, and only sparingly east or west of them; and also that the igneous rock should be essentially the same throughout the thousands of miles from Nova Scotia to North Carolina. The igneous and aqueous rocks (sandstone) are so associated that they necessarily come into the same history. Mount Tom and Mount Holyoke, of Massachusetts, are examples of these trap ridges; also East Rock and West Rock, near New Haven, and the Hanging Hills, near

*Annals de Mines, p. 256.

†*Op. cit.*, p. 73.

‡ Manual of Geology, third edition, p. 417.

Meriden, in Connecticut; the Palisades along the Hudson River, in New York; Bergen Hill and other elevations in New Jersey.

"In Nova Scotia trap ridges skirt the whole red-sandstone region and face directly the Bay of Fundy; Cape Blomidon, noted for its zeolitic minerals, lies at its northern extremity on the Bay of Mines.

"In Connecticut the ridges and dikes are extremely numerous, showing a vast amount of igneous action. * * * They commence near Long Island Sound, at New Haven, where they form some bold eminences, and extend through the State and nearly to the northern boundary of Massachusetts. Mounts Holyoke and Tom are in the system. The general course is parallel to that of the Green Mountains.

"Although the greater part of the dikes is confined to the sandstone regions, there are a few outside, intersecting the crystalline rocks and following the same direction, and part, at least, of the same system.

"Even the little Southbury Triassic region, lying isolated in western Connecticut, has a large number of trap ridges, and such a group of them as occurs nowhere else in New England outside of the Triassic. Their direction and positions in overlapping series are the same as in the Connecticut valley.

"The trap usually forms hills with a bold columnar or front and sloping back. When nearly north and south in direction the bold front is to the westward in the Connecticut Valley, and to the eastward in New Jersey. It has come up through fissures in the sandstone, which varied from a few inches to 300 feet or more in breadth. In many cases it has made its way out by opening the layers of sandstone, and in such cases it stands with a bold front, facing in the direction toward which it thus ascended."

Connecticut.—The extensive diabase outcrops noted above as occurring at East and West Rocks, north of New Haven in this State, are quarried for foundation walls and for paving purposes in the near vicinity. The rock is too dull in color for ornamental work.

Maine.—Diabase is quarried at three localities in this State, Addison, Vinalhaven, and Tenant's Harbor. At Addison the rock occurs in extensive outcrops close by the water's edge. Single blocks 66 by 10 by 20 feet have been moved in the quarries, and natural blocks 90 by 10 by 15 feet occur. The chief defects in the stone are said to be the so-called "knots," which consist of irregular patches of coarse feldspar and dark crystals of hornblende. There are also occasional seams, causing the rock to split unfavorably. The rock is moderately fine-grained, very dark gray, sometimes almost black or spotted black and white on a polished surface and of a fine appearance. It has been used in the walls inclosing the Capitol grounds at Washington, in the construction of a bank at Montreal, and is quite generally used for monuments in Boston, New York, Brooklyn, Washington, Montreal, and Quebec. The Vinalhaven diabase is less extensively worked on account of its hardness It is of finer grain than the Addison stone and uniformly dark-gray,

nearly black, in color. It is used to some extent for building material and also in cemetery work. The Tenant's Harbor (Saint George, Knox County) stone closely resembles that of Addison, and is used for similar purposes. These are all most excellent stones, and it is a matter for congratulation that they are being so extensively introduced, and, to some extent, replacing the marbles in monumental work. The cost of working is, owing to their compact structure, somewhat greater than that of granite, but the results fully justify the increased outlay. All the above, it should be noted, are known commercially as "black granite."*

Massachusetts.—Diabase is quarried for foundation walls, general constructive purposes, and monumental work at Medford and Somerville in this State. Samples received from these localities are, however, coarser, lighter in color, and much inferior in point of beauty to those just described.

New Jersey.—The extensive outcrops of diabase, or "trap-rock," known as the Palisades of the Hudson River in northeastern New Jersey furnish an inexhaustible supply of this material, and which is at present quite extensively quarried about Guttenberg, Weehawken, West New York, and southward along the Palisades as far as Montgomery avenue in Jersey City.† The rock is used chiefly for paving, and the quarries are small affairs worked by gangs of from two to five men. Two sizes of blocks are prepared. The larger, which are known as specification blocks, are 4 by 8 or 10 inches on the head and 7 to 8 inches deep. The second size, which are called square blocks, are 5 to 6 inches square and 6 or 7 inches deep. The specification blocks bring about $30 per thousand in the market, and the square only about $20 per thousand. It is estimated that some 4,000,000 of the specification and 1,000,000 of the square blocks were quarried in 1887, valued at $140,000.

There are three principal grades of the rock quarried. A fine-grained variety at Mount Pleasant, a rocky hill north of the Pennsylvania Railroad; a light-gray variety at Bergen Cut, south of the railroad;

* It should be remarked that all of these diabases differ radically in structure and composition from any others here mentioned, and deserve a more thorough and careful study than they have yet received. All contain a rhombic pyroxene pleochroic in red, green, and brown colors, and which is evidently hypersthene, while certain sections of the Addison rock show a pyroxenic constituent carrying an abundance of the rhombic inclosures so characteristic of entstatite. Both the Addison and Vinalhaven rocks were in the collection and marked as diabase on my assuming charge, and as such I considered them in my paper on the Maine building stones (Proc. Nat. Mus., Vol. VI, 1883). The Tenant's Harbor rock is presumably the one described as olivine diabase by Wadsworth and Dickerson (Proc. Bos. Soc. Nat. Hist., Mar., 1884, p. 28).

† The Hudson River Palisade rock is called *greenstone* by Mahan (Civil Engineering, p. 3), who states that it is composed of hornblende and common and compact feldspar. This is obviously an error. The rock contains neither hornblende nor "common" (orthoclase) feldspar, but is wholly composed of augite and plagioclase feldspar with a few minute accessories, as magnetite and apatite.

and a dark, almost black, variety at Weehawken and West New York. Other quarries of this rock are worked at Orange Mountain, Snake Hill, Hudson County, and at Morris Hill in Paterson. In the western part of the State the outcrops are not so extensive, but quarries are worked at Rocky Hill, near Titusville, Smith's Hill, and near Lambertville. At Rock Church, 4 miles from Lambertville, the rock is quarried and used for monumental work as well as for general building purposes, being put upon the market under the name of black granite. The rock from the Palisade quarries has also been quite extensively used in and about Jersey City for building purposes. St. Patrick's Cathedral, and the Hudson County Court House, as well as many private buildings, are of this stone, but the effect as a whole is not pleasing, owing to the somber colors of the material. Employed in connection with brick or lighter stone, to give variety and contrast, the effect is admirable.

The finely broken stone is also used very extensively for railroad ballast and road-making. Several of the quarries near Orange Mountain have machines for breaking up the stone for this purpose.*

Pennsylvania.—The principal quarries of diabase in this State are at Collins Station, Lancaster County, and near York Haven, York County. At the latter place the face of the quarry is about 70 feet in height. The rock lies in huge natural blocks sometimes weighing hundreds of tons and having curved outlines giving them a sort of oval shape. Stone from this quarry is used only by the Northern Central Railroad in the construction of bridges, culverts, etc.

At Collins Station diabase is more extensively quarried than at any other locality in the State. The stone is used for all manner of building purposes and monumental work. The foundation of the new Harrisburg post-office and the soldiers' monument in this city are from this material.

In the vicinity of Gettysburgh diabase has been quite extensively quarried from bowlders, and has been used for head-stones in the national cemetery at this place.

Virginia.—As in the States to the east and north, the Triassic beds of Virginia are cut by large dikes of "trap" or diabase, and which in some cases are capable of affording excellent material for paving blocks and general building and ornamental work. So far as the author is aware quarries have been opened upon these dikes in but two localities, at Cedar Run, near Catlett's Station on the Virginia Midland Railroad, and near Goose Creek, about 3 miles east of Leesburgh, in Loudoun County. Specimens of these rocks which we have examined represent the coarser varieties of our Mesozoic diabase, are of a dark gray color, very strong, and apparently durable. That from Goose Creek has been found to stand a pressure of 23,000 pounds per square inch, and, as the author has observed, undergoes no change on an exposure of twenty-

* See Ann. Rep. State Geologist of New Jersey 1881, pp. 60–63.

five years other than a slight and in no way objectionable darkening of color. Neither stone has been used as yet for other than paving purposes and bridge abutments, though they are apparently well adapted to all kinds of work for which their color and hardness qualify them.

(2) GABBRO.

The rock gabbro differs from diabase mainly in containing the foliated pyroxene diallage in place of augite. It is not at present quarried to any extent in this country, though for no apparent reason other than that it is difficult to work.

Very extensive outcrops of a dark gray, almost black gabbro of medium fineness of texture occur in the immediate vicinity of Baltimore, Md., but which have been quarried only for purposes of rough construction close at hand. The rock is popularly known as "nigger-head" owing to its hardness, dark color, and its occurrence in rounded bowlders on the surface.*

At Rice's Point, near Duluth, Minn., there occurs an inexhaustible supply of a coarse gabbro, which has been studied and described by Professor Winchell.† The feldspar of the rock, which is labradorite, according to the authority quoted, sometimes prevails as at Beaver Bay, in crystals one-half to three-fourths of an inch across, and to the almost entire exclusion of other constituents. In this form the rock varies from lavender blue or bluish gray to light green, and acquires a beautiful surface and polish, and is considered as constituting a valuable material for ornamental slabs and columns. The typical gabbro of the region is of a dark blue-gray color, and "has been employed in a few buildings at Duluth, both in cut trimmings and for rough walls." It has also been used for monuments and for bases, to which it is especially adapted, being cut under the chisel and polished more easily than any of the crystalline rocks that contain quartz. The stone is known popularly as "Duluth granite." The same kind of rock occurs at Taylor's Falls, but is little used, though favorably situated for quarrying and transporting.

A rock closely allied to the gabbros and diabases is the so-called norite, which consists essentially of the minerals hypersthene and a plagioclase feldspar. The only rocks of this nature now regularly quarried are at Keeseville, N. Y., and Vergennes, Vt. The first is known commercially as "Au Sable granite," and the second as "Labradorite granite." Both are coarse-grained, dark-gray rocks, much resembling the darker varieties of the Quincy granites, from which, however, they differ radically in mineral composition. They take a high lustrous polish, frequently show a beautiful bright bluish iridescence, and are

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* This is the rock the interesting petrographical features of which have lately been made known by Dr. Williams, of Johns Hopkins University. See Bull. U. S. Geol. Survey, No. 28.

† Geol. of Minn., Vol. I, pp. 148–9.

admirably adapted for polished columns, pilasters, and other decorative work. The lasting power of the norites, when polished, is yet to be ascertained. After an exposure of untold years in the quarry bed the surface has turned white. No data are obtainable for calculating their lasting qualities in the finished structure.

(3) MELAPHYR.

The melaphyrs, as defined by Rosenbusch,* are massive eruptive rocks, consisting of plagioclase, augite, and olivine, with free iron oxides and an amorphous or "porphyry" base. They are thus of the same mineral composition as the basalts and olivine diabases, but differ structurally, and belong in great part to the Carboniferous and older Permian formations. Although very abundant in many parts of the United States, they are scarcely at all quarried owing to their dull colors and poor working qualities.

In the Brighton district of Boston, but a few miles out of the city proper, and in other localities in the vicinity, there occur small outcrops of a greenish or sometimes purplish melaphyr, or "amygdaloid," the lithological nature of which was, I believe, first correctly stated by E. R. Benton.† The prevailing color of the rock is greenish, often amygdaloidal, the amygdules being composed often of epidote, thus spotting the surface with greenish-yellow blotches. The rock is greatly altered, only the feldspars of the original constituents remaining now recognizable, while chlorite, quartz, calcite, epidote, and several other minerals occur as secondary products. The rock is nevertheless very firm, compact, and durable, and is being quarried to some extent for rough work. It would seem fitted for a yet wider architectural application.

(4) BASALT.

This rock differs from diabase only in point of geological age, being a product of post-Tertiary eruptions. It is, as a rule, less perfectly crystalline, still retaining portions of its glassy magma, and the surfaces of the flows are often less compact owing to their having been exposed to atmospheric agencies for a shorter period, and consequently having suffered less erosion. Owing in great part to the fact that basalts occur in this country only in the western and more recently settled portions, as do also the andesites and rhyolites, they have been heretofore but little utilized. There would seem, however, no reason for excluding the rock from the list of available building materials in those regions where it occurs in such form as to be accessible. At Petaluma, Bridgeport, and other places around the bay of San Francisco there lie immense sheets of this rock, but which are worked now only for paving materials. Like the andesites and rhyolites the basalts will not polish, and their colors are such as to exclude them from all forms of interior decorative work.

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* Mik. Physiog. der Massigen Gesteine, p. 392.

† *Proc. Bos. Soc.*, Vol. xx, p. 416.

K.—AMPHIBOLE PLAGIOCLASE ROCKS (TRAP AND GREENSTONE IN PART).

(1) DIORITES.

Diorite from the Greek word *διορίζειν*, to distinguish.

Diorites are entirely crystalline granular rocks composed essentially of plagioclase and hornblende.

They are pre-Tertiary eruptive rocks occurring mostly in dikes and intrusive sheets and basic in composition, containing only from 50 to 54 per cent. of silica. In structure they are massive. The individual crystals composing the rock are sometimes grouped in globular aggregations forming the so-called *orbicular diorite* or *kugel* diorite. The texture is as a rule compact, fine, and homogeneous, though sometimes porphyritic. The common colors are dark gray or green. According to Zirkel the average composition is:

	Per cent.
Silica	48.50 to 60.88
Alumina	15.72 to 22.12
Protoxide of iron	6.26 to 11.92
Lime	5.47 to 7.99
Magnesia	0.54 to 9.70
Potash	1.05 to 3.79
Soda	2.20 to 5.21
Water	0.60 to 1.90

In classification two principal varities are recoguized, mica diorite or diorite in which black mica is present in excess of the hornblende, and hornblende diorite or diorite proper. The presence of quartz gives rise to the variety quartz diorite. The name tonalite has been applied by Vom Rath to a quartz diorite containing the feldspar andesite and very rich in black mica and which occurs in the southern Alps.

Diorites are commonly known by the names trap and greenstone, as are also the diabases.

These rocks are as a rule exceeding compact and strong, but are scarcely at all used for building purposes owing to their lack of rift and poor working qualities in general. Their somber colors are also a drawback to any form of architectural display. In England diorites are stated by Hauenschild* to be largely used for road materials, while the celebrated kugel diorite or napoleonite of Corsica has been abundantly utilized through Italy for interior decorative work.

Porphyritic diorites, or porphyrites, may be said to bear the same relation to true diorites as do the quartz porphyries to granites. That is, they consist of a compact felsitic base in which hornblende or feldspar is porphyritically developed. The celebrated red Egyptian porphyry or "Rosso Antico" is a porphyrite as shown by Delesse.† The source of this rock is stated by this authority to be the Dokhan Mountains,

* Katechismus der Baumaterialien, p. 81.

† Bull. Soc. Geol. de France, 1849–50, p. 524.

about 25 miles from the Red Sea and 85 miles from ancient Captos (now called Kypt). Rocks of this class, though in no way comparable from the standpoint of beauty, have been described by Hawes* as occurring in New Hampshire at Campton Falls, North Lisbon, Dixville, and Dixville Notch; a mica diorite is also described as occurring at Stewartstown. None of these are put to any practical use. A dark gray granitic appearing diorite of variable texture occurs near Reading, Berks County, Pa., which may answer for rough construction. It is not a handsome stone, and is, moreover, hard to work.

The Museum collections contain a cube of a compact light greenish gray diorite, carrying quite an amount of greenish mica and plentifully besprinkled with white porphyritic feldspars from near El Paso, Tex. This cuts to a sharp edge and acquires a good surface and polish. It appears like a good stone for ordinary purposes of construction.

A somewhat similar stone is found near Monarch, Chaffee County, Colorado.

A quartz diorite of a coarse granitic structure is found and quarried at Rocklin, Placer County, Cal. The stone resembles granite in general appearance and works with equal facility.

(2) THE ANDESITES.

Under the name of andesites is included a group of volcanic rocks of Tertiary and post-Tertiary age, and consisting essentially of a triclinic feldspar and hornblende, augite, or black mica.

In structure the andesites are rarely entirely crystalline, but usually present a fine densely microlitic or partly glassy groundmass. According as they vary in composition four principal varieties are recognized: (1) Quartz andesite (Dacite) or andesite in which quartz is a prominent ingredient; (2) hornblende andesite; (3) augite andesite, and (4) mica andesite, each taking its name according as hornblende, augite, or mica is the principal accessory mineral. Hypersthene andesite, or andesite in which the mineral hypersthene is a leading constituent, is also common in many of the Western States and Territories.

The andesites are as yet but little used for structural purposes, and this largely for the same reasons as were given in the chapter on Liparites. Like the rhyolites they will not polish and are in no way suited for decorative work. Although very abundant throughout many of the Western States and Territories they have been quarried in an itinerant way only at Reno and Virginia City, Nev. The rock from the latter source is said to quarry easily and cut well when first taken out, and to harden on exposure. The Reno andesite has been used in the construction of the prison and a few stores at that place.

* Geol. of New Hampshire, Vol. III, Part IV, p. 160.

L.—SCHISTOSE, OR FOLIATED ROCKS.

(1) THE GNEISSES.

The gneisses, as already noted, have essentially the same composition as do the granites, from which they differ mainly in their foliated or schistose structure. On account of this schistosity the rocks split in such a way as to give parallel flat surfaces, which render the stone servicable in the construction of rough walls and for street curbing. This structure, which is caused mainly by the arrangement of the mica and other minerals in parallel layers, is, however, a drawback to the uniform working of the stones, and hence they are more limited in their application than are the granites. These rocks are frequently called by quarrymen *stratified* or *bastard* granites. The name *gneiss*, it should be stated, is of German origin, and should be pronounced as though spelled *nīs*, never as *nees*. For reasons already given the gneisses have been included under the chapter on granites in the present work.

(2) THE SCHISTS.

Mica schist is a rock that consists essentially of quartz and mica. It usually possesses a distinct schistose structure, due to the parallel arrangement of these minerals, as was noted in the gneiss, from which it may be said to differ only in its lack of feldspar. It is a rock which is supposed to have been formed by the deposition and subsequent crystallization of sediments, and consequently the structure of these minerals and their arrangement are markedly stratified. These peculiarities of the schists are not such as to render them favorites for purposes of fine construction. They are, however, in most instances broken out from the ledges with comparative ease, and for rough construction, such as foundations and bridges, as well as for flagging, they are extensively employed.

The mica of the schists may be either muscovite or biotite, or both; in short, the schists may be characterized by one or more of the same accessories as are the granites and gneisses, and we may have just as many varieties. Through a diminution in the amount of mica these rocks pass into quartz schists, and by an increase in the amount of feldspar into gneisses. The relative amounts of quartz and mica in the schists varies almost indefinitely, the percentage of silica, which is largely dependent upon the amount of quartz, varying from 40 to 80 per cent. The finer grained, more compact varieties of mica schist make very fair building material, but the coarser and more schistose varieties are not at all desirable, especially if the mica be biotite and it occurs in great abundance.

In accessory minerals the schists are particularly rich. Some of the more common of these are garnet, feldspar, epidote, cyanite, hornblende,

chlorite, talc, staurolite, magnetite, pyrite, tourmaline, and rutile. Through an increase in the amount of hornblende, chlorite, or talc, the rock passes into hornblende, chlorite, or talc schist.

Owing to their schistose structure and poor working qualities the schists are but little used for architectural purposes, as already noted. One of the most important of these rocks at present worked in this country is the biotite schist near Washington, D. C. This is quite extensively quarried, though in a crude and itinerant manner, both in the District of Columbia and on the opposite side of the Potomac River, in Virginia. The rock is as a rule fine grained and compact, and of a blue-gray color, whence its popular name of "Potomac bluestone." It is at times scarcely at all schistose, and contains a very considerable proportion of feldspar, thus approaching gneiss in composition. Several important structures have been made of this stone, including Georgetown College and one or two churches. It can be worked, however, with great difficulty, and it is only by taking advantage of the natural joint faces that it can be utilized with any degree of economy. Pyrite is very abundant in certain portions of the rock, and shows its utter unreliability by retaining its bright, brassy luster unchanged in some cases for many years, while in others it oxides almost immediately.*

In Cape Elizabeth, Maine, near Portland, there occurs a fine-grained talcose schist which is peculiar for the readiness with which it breaks out into jointed blocks of about the right dimensions for building. By taking advantage of this jointing several churches and other buildings in Portland have been erected and present a respectable appearance, though through the oxidation of the included pyrite the walls are stained almost beyond recognition. These joints are as sharp and clean as though cut with a knife, and are usually indistinguishable in the quarry, having been recemented by calcite. A few blows from a hammer on the end of a block will, however, almost always cause joints to open, and often in very unexpected places.

In the town of Bolton, Worcester County, Mass., there occurs a mica schist that has been quarried for many years to furnish flagging materials for Hartford and other New England cities. The rock is fine grained, distinctly schistose, and evenly laminated; it therefore splits out readily into thin plates eminently suited for the purposes to which it is applied.

* It is possible that both ordinary pyrite and the gray variety, marcasite, are present in these rocks, and that it is the latter mineral that so readily oxidizes, while the pyrite remains unchanged.

QUARRIES OF TRIASSIC SANDSTONE, PORTLAND, CONNECTICUT.

Drawn from a photograph

M.—FRAGMENTAL ROCKS.

(1) SANDSTONES, BRECCIAS, AND CONGLOMERATES.

(*a*) Composition and Origin.

Sandstones are composed of rounded and angular grains of sand so cemented and compacted as to form a solid rock. The cementing material may be either silica, carbonate of lime, an iron oxide, or clayey matter. Upon the character of this cementing material, more perhaps than upon the character of the grains themselves, is dependent the color of the rock and its adaptability for architectural purposes. If silica alone is present the rock is light colored and frequently so intensely hard that it can be worked only with great difficulty. Such are among the most durable of all rocks, but their light colors and poor working qualities are something of a drawback to their extensive use. The cutting of such stones often subjects the workmen to serious inconvenience on account of the very fine and sharp dust or powder made by the tools, and which is so light as to remain suspended for some time in the air. The hard Potsdam sandstones of New York State have been the subject of complaint on this score. If the cement is composed largely of iron oxides the stone is red or brownish in color and usually not too hard to work readily.* When the cementing material is carbonate of lime the stone is light colored or gray, soft, and easy to work. As a rule such stone do not weather so well as those with either the siliceous or ferruginous cement, owing to the ready solubility of the lime in the water of slightly acidulated rains; the siliceous grains become loosened and the rock disintegrates. The clayey cement is more objectionable than any yet mentioned, since it readily absorbs water and renders the stone more liable to injury by frost. Many sandstones contain little if any cement, but owe their tenacity simply to the pressure to which they were subjected at the time of their consolidation. Such stones are generally of a grayish hue, easy to work, and if the amount of cohesion be sufficiently great, are very durable. The finer varieties of these stones, such as the Euclid "bluestone" and "Berea grits," are utilized in the manufacture of grindstones and whet stones. Since they contain little cementing material they do not become polished when exposed to wear, but crumble slowly away, presenting always fresh, sharp surfaces to be acted upon. In certain of our Potsdam sandstones the siliceous cement is found to have so arranged itself with relation to the grains of sand as to practically convert it into a crystalline rock or quartzite. This has already been referred to in the chapter on microscopic structure.

* Julien states that in the Tertiary sandstones of the Appalachian border the ferruginous cement is largely turgite; in the Triassic and Carboniferous sandstones it is largely limonite, and in the Potsdam sandstones of Lake Champlain and the southern shore of Lake Superior it is largely hematite. (Proc. A. A. A. S., Vol. XXVIII, 1879, p. 408.)

Sandstones are not in all cases composed wholly of quartz grains, but frequently contain a variety of minerals. The brown Triassic sandstones of Connecticut, New Jersey, and Pennsylvania are found, on microscopic and chemical examination, to contain one or more kinds of feldspar and also mica (see Fig. 6, Plate II), having, in fact, nearly the same composition as a granite or gneiss, from which they were doubtless originally derived. According to Dr. P. Schweitzer,* a fine-grained sandstone from the so-called Palisade range in New Jersey contains from 30 to 60 per cent. of the feldspar albite. That quarried at Newark, in the same State, contains, according to his analysis, albite, 50.46 per cent.; quartz, 45.49 per cent.; soluble silica, .30 per cent.; bases soluble in hydrochloric acid, 2.19 per cent., and water, 1.14 per cent. Iron pyrites is a common ingredient of many sandstones. Unless quite abundant the chief danger to be apprehended from the use of such stone is the change of color it is liable to undergo on exposure through its oxidation.

Sandstones are of a great variety of colors; light gray (almost white), gray, buff, drab or blue, light brown, brown, pink, and red are common varieties, and, as already stated, the color is largely due to the iron contained by them. According to Mr. G. Maw† the red and brownish-red colors are due to the presence of iron in the anhydrous sesquioxide state, the yellow color to iron in the hydrous sesquioxide state, and the blue and gray tints to the carbonate or the protoxide of iron. It is also stated that the blue color is sometimes caused by finely-disseminated iron pyrites, and rarely by an iron phosphate.‡ (See page 306.)

Sandstones vary in texture from almost impalpably fine-grained stones to those in which the individual grains are several inches in diameter. These coarser varieties are called *conglomerates*, or, if the grains are angular instead of rounded, *breccias*. Neither of these varieties are at present quarried in this country to any great extent, though in foreign countries calcareous breccias form some of the most beautiful marbles.

All sandstones, when freshly quarried, are found to contain a variable amount of water, which renders them soft and more easily worked, but at the same time peculiarly liable to injury by freezing. So pronounced is this character that many quarries in the northern regions can be worked only in the summer months, as during the cold season the freshly quarried material would freeze, burst, and become entirely ruined. It is customary also for dealers to refuse to assume any risks of injury from freezing to which such stone may be liable after shipment. After the evaporation of this "quarry water," as it is called, the stone is found to be considerably harder, and hence more difficult to work. This hardening process is explained by Newberry and others by the

* American Chemist, July, 1871, p. 23.

† Quar. Jour. Geol. Soc. of London, XXIV, p. 355.

‡ Notes on Building Construction, Part III, p. 35.

theory that the quarry water holds in solution certain of the cementing materials, as has been already noted (p. 339).

(*b*) Varieties of Sandstones.

Many varieties of sandstones are popularly recognized, the distinctions being founded upon their composition, structure, the character of the cementing material, or their working qualities. *Arkose* is a sandstone composed of disintegrated granite. *Ferruginous*, *siliceous*, and *calcareous* sandstones are those in which these substances form the cementing material. *Argillaceous* sandstones contain clay, which can easily be recognized by its odor when breathed upon. *Flagstone* is a sandstone that splits readily into thin sheets suitable for flagging; the same term is applied to other rocks, as the schists and slates, which serve a similar purpose. *Freestones* are so called because they work freely in any direction, their bedding or grain not being strongly enough marked to in any way interfere with this property. *Graywacke* is a compact sandstone composed of rounded grains or fragments of quartz, feldspar, slate, and other minerals, cemented by an argillaceous, calcareous, or feldspathic paste. This term is no longer in general use. *Quartzites* result from the induration of sandstones, a result brought about either by pressure or, more commonly, by the deposition of silica between the granules.

Sandstones occur among rocks of all ages, from the Archæan down to the most recent; none are, however, at present used to any great extent for building purposes in this country that are of later origin than Triassic, or possibly Cretaceous. In the list of natural building materials of the United States sandstone ranks third in importance; the census returns for 1880 showing a product of 24,776,930 cubic feet, valued at $4,780,391.

(*c*) Sandstones of the Various States and Territories.

Alabama.—On the line of the Alabama Great Southern Railway, some 60 or 100 miles from Chattanooga, Tenn., there occurs a yellow sandstone that is sufficiently soft when first quarried to be cut with an ax, and which hardens sufficiently on exposure to be very durable in that climate. Samples of this stone received from De Kalb County are of decidedly inferior quality.

Arizona.—There is at present little demand for building stone in this Territory, and consequently but little is known regarding its available material. From Yavapai County, on the line of the Atlantic and Pacific Railroad, we have received a block (No. 35571) of fine grained, compact, light-pink sandstone, that from its warm and pleasing color and easy working qualities would be eagerly sought by Eastern builders were it more accessible. So far as we are informed, it is not at present quarried to any extent.

Arkansas.—Brown massive "freestone" that will make a good building stone is stated by Owen* to occur in Van Buren County.

*Geol. of Arkansas, 1858, p. 75.

California.—Around the Bay of San Francisco there occur sandstones of a considerable variety of colors which are beginning to come into use to some extent. The prevailing colors here are brownish and gray. On Angel Island, in Marin County, there occurs a fine sandstone of a greenish-gray color, which has been used in the Bank of California building, and others of a lighter shade are found in various parts of Alameda County. A few miles south of San José, Santa Clara County, there are also inexhaustible supplies of light gray and buff stone, but which are at present worked only in a small way; Near Cordelia, Solano County, there occurs a coarse, dark-gray volcanic tuff, that can, perhaps, be utilized for rough construction should occasion demand.

Colorado.—This State contains a variety of sandstones, of good quality, but which, owing to lack of transportation facilities and the thinly settled condition of the country, are as yet in little demand. Near Fort Collins, in Larimer County, a fine light-gray stone occurs which is excellent for flagging and foundations, but contains too much pyrite for fine building purposes. At Coal Creek, in Fremont County, is also a fine grayish or buff stone closely resembling that of Berea, Ohio. As seen by the writer in the stone-yards of Denver, this is a most excellent material, being free from flaws, of good color, and cutting to a sharp edge. It is stated that it occurs in inexhaustible quantities and is obtainable in blocks of large size. At Glencoe, above Golden, in Jefferson County, there occurs a deep salmon-red stone of a beautiful warm and lively hue. It is said to work with considerable difficulty, but is much sought on account of its color. Its principal market is now Chicago, but it is a matter of regret that it can not be introduced into our eastern markets. Near Morrison, in the same county, there occur extensive beds of red and nearly white sandstone. The white is not considered desirable, but the red is much sought for trimming purposes. It is stated to absorb water readily, and hence to be peculiarly liable to damage from frost. The light-colored stone used in the construction of the court-house at Denver was obtained from Cretaceous beds near Cañon City. Trinidad, Las Animas County, also furnishes a good sandstone, which is used in Denver, and another important stone of good quality is brought from Amargo, in Rio Arribo County, across the line in New Mexico.

Connecticut.—As already noted (ante, p. 289) the first quarries of sandstone to be systematically worked in this country were those located in the now well-known Triassic beds at Portland and Middletown in this State. The area of the Triassic deposit in New England as given by Dana* extends from New Haven on Long Island Sound to northern

* Manual of Geology, p. 404. The entire area of the Triassic sandstones in the United States as given by this authority is divided into three parts: (1) the Connecticut area as given above; (2) the Palisade area, commencing along the west side of the Hudson River in the southeast corner of New York, near Piermont, and stretching southwestward, through Pennsylvania, as far as Orange County, Va., about 350 miles long; and (3) the North Carolina area, commencing near the Virginia line and extending through North Carolina over the Deep River region, 120 miles long.

Massachusetts, having a length of 110 miles and an average width of 20 miles. The stone is at present quarried only at Portland, Middlesex County, East Haven, New Haven County, and Manchester, Hartford County; though small quarries have been worked from time to time to furnish stone for local consumption at East Windsor, Hayden's Station, Suffield, Newington, Farmington, and Forrestville in this same county. The Manchester stone is a beautiful fine-grained reddish variety, and that from East Haven is represented as excellent for rock-faced work. The Portland quarries are, however, by far the most important of any of these, and it is estimated that from their combined areas not less than 4,300,000 cubic feet of material have been taken.

As now worked at this place the quarries descend with absolutely perpendicular walls on three sides for a depth in some cases of upwards of 150 feet, the fourth side being sloping to allow passage for teams or workmen. The stone is of medium fineness of texture, of a uniform reddish-brown color, and lies in nearly horizontal beds varying from a few inches to 20 feet in thickness. Natural blocks 100 by 50 by 20 feet occur, and hence blocks of any desired size can be obtained. In quarrying, channeling machines are used to some extent, though in many cases large blocks are first loosened by means of deep drill holes and heavy charges of powder, and these then split up by wedges. The blocks are roughly trimmed down with picks at the quarry and shipped thus to New York and other large cities to be worked up as occasion demands. Scarcely any of the material is dressed at the quarries. The stone has been used in all our leading cities, particularly in New York, and has even been shipped to San Francisco via Cape Horn. But little quarrying is done in cold weather, as care must be taken against freezing while the stone is full of quarry water, a temperature of 22° F. being sufficient to freeze and burst fine blocks of freshly-quarried material. About a week or ten days of good drying weather is considered sufficient to so season a stone as to place it beyond danger from frost.

Great outcry has from time to time been raised against the Portland stone on account of its disposition to scale or flake off when laid in exposed places. While it is undoubtedly true that it is unfit for carved work in exposed situations, still the author can but feel that the architect and builder are largely responsible for the many ruined fronts caused by this scaling, to be seen in New York and elsewhere. It is the almost invariable custom in building to split the stone with the grain into slabs but a few inches thick and to veneer the walls of buildings with these slabs placed on edge. Let thicker blocks be used and the stone laid on its bed, as nature laid it down in the quarry, and this defect will prove less serious, if it be not entirely remedied. But no stone that is capable of absorbing so large a percentage of water as is much of the Connecticut and other of our Triassic stones, can be more than very moderately durable in the very trying climate of our Northern States.

There is, however, a vast difference in material from the same quarry. I have seen tombstones perfectly sound and legible after an exposure of nearly two hundred years, while others begin to scale in less than ten. The remarks made in the chapter on selection of stone are especially applicable here.

Dakota.—The pink and red quartzite from Sioux Falls in this State is one of the most promising stones of the West. Chemically the stone is almost pure silica, with only enough iron oxide to impart color to it. It is so close grained as to be practically impervious to moisture, so strong as to endure a pressure of 25,000 pounds to the square inch, and will take a polish almost like glass, with which it may favorably compare in durability. In color the stone varies from light pink to jasper red, and it is one of the few stones at present quarried in the United States which is equally well adapted for rough building and for ornamental work, both interior and exterior. Professor Winchell, in reporting upon this stone, states that it bears a heat up to that of redness without cracking or scaling. The writer is informed by Mr. J. H. Drake, of Saint Paul, that the stone will shortly be introduced into the Eastern markets for tiling, decorative work, and general building purposes. The chief drawback to the stone, as may readily be imagined, is its great hardness, which is fully equal to that of pure quartz, or 7 of the scale as given on page 294. It however possesses a remarkably perfect rift and grain, and by especially designed apparatus the company expect to be able to put it upon the market at such prices as shall insure its adoption, and at the same time return a fair profit.

The stone has been used in the construction of the "Queen Bee" flouring mill at Sioux Falls, a structure 100 feet long, 80 feet wide, and 106 feet high, the walls being 5 feet thick at the base and averaging 2 feet 9 inches throughout. It has also been used in the construction of several private residences, and the Dakota penitentiary in this same city, and in the buildings of the deaf-mute school at Keokuk, and those of the Grinnell College at Grinnell, Iowa. It has also been used in polished columns and pilasters in the German-American Bank and Union Depot buildings at Saint Paul, Minnesota.

Idaho.—The Museum has received samples of a rather coarse, very light-colored, sandstone of fair quality from Boisé City, in this Territory, but we have no information regarding their availability or the extent of the deposits.

Illinois.—Carboniferous sandstones of light and dark-brown color and good quality are found near Carbondale, in this State. The stone is of medium texture, works readily, and closely resembles some of the Triassic brownstones of Connecticut. The beds are about 14 feet thick and are capable of furnishing blocks of large dimensions. A very fine-grained light bluish-gray laminated stone is quarried in a small way near Xenia, and other sandstones of fair quality occur at Suka, Marion County, Chester, Randolph County, and various points in Perry and Greene Counties.

Indiana.—Very light, almost white, and bluish-grey sandstones, of fine, sharp, and even grain, occur in French Lick Township, Orange County, and in a few localities in Warren and Perry Counties. A part of the Orange County stone is used for whetstones, and is known commercially under the name of "Hindostan oil-stone."

Georgia.—No sandstones are at present quarried in this State, but it is stated that "the Chattooga Mountains contain a considerable variety and of various shades of colors, among which are white, gray, buff, brown, and red. Some of these exist in massive compact beds, while others have a jointed structure that make them easily quarried. The thickness of the entire sandstone series is about 800 feet. Building stone of this character may be had also on Lookout and Sand Mountains, in the Cohutta range."* We have as yet seen none of the above.

Iowa.—This State produces but little of value as building material in the way of sandstones. Coarse, dark brown stones of Carboniferous and Cretaceous ages occur in Muscatine and Cass Counties and have been quarried to some extent, but their qualities are not such as to cause them to be used for other than rough work in the near vicinity.

Kansas.—Good sandstones are stated by Professor Broadhead to occur in several of the counties in the southwestern part of this State, though, so far as we have observed, few if any of these are of such a quality as to acquire other than a local market. A fine, deep blue, gray laminated stone is found at Parsons, and a brownish one at Oswego, in Labette County, also a brownstone at Pawnee, Crawford County, and others of various hues in Bourbon, Neosho, Montgomery, Wilson, Woodson, Greene, and Elk Counties.

Kentucky.—The sandstones of this State, so far as shown by the collections, are all of a light color, fine-grained and rather soft. Light buff and pinkish colors are found in Simpson, Grayson, Todd, Johnson and Breckenridge Counties, some of which are of a beautiful mellow tint. Light-gray stones of apparent good quality, and closely resembling the Berea of Ohio, occur at Blue Lick Mountain, Livingston in Rockcastle County, and in Pineville, Bell County. We are unable to give further information regarding them.

Maryland.—Sandstone of such a nature as to be in demand for other than local uses is quarried in but a single locality in this State. In Montgomery County, near the mouth of Seneca Creek, about 30 miles northwest from the city of Washington, there occurs a considerable deposit of Triassic sandstone which for many years has been quarried more or less to furnish material for the Washington market. The stone is as a rule light reddish-brown in color, of fine and even texture, and well adapted for all manner of building and ornamental work. The writer has examined this stone, both in the quarry and in various buildings, and does not hesitate to pronounce it one of the best of our

* Commonwealth of Georgia, p. 136.

Triassic stones. Clay-holes abound in some portions of the rock, but can be avoided by careful selection. The stone is not at all shaley and shows little, if any, disposition to scale when exposed to the weather. The Smithsonian Institution, erected in 1848–'54 from this stone, shows few defects from weathering alone, and these only in those cases where they might have been avoided by judicious selection. On blocks of this stone in the aqueduct of the Chesapeake and Ohio Canal which have been constantly permeated by water every season for fifty years, the tool-marks are still fresh and no signs of scaling are visible other than are produced by too close contact at the joints. The quarries are conveniently situated near by the canal, where stone can be readily loaded upon boats for the Washington markets, from whence it can be shipped by rail or vessel to all our principal cities.

Massachusetts.—The beds of Triassic sandstone, which furnish in Connecticut the well-known Portland brownstone, are continued up the valley of the Connecticut River to the northern boundary of Massachusetts and furnish in several places valuable deposits of building material. At East Long Meadow, in Hampton County, quarries are worked in this formation which produce a rather finer grained stone than that of Portland and of a bright brick-red color. Like all the Triassic stones it is soft and works readily, and on account of its warmth of color can be used with very pleasing effects in a variety of combinations.

The extensive formation of Primordial conglomerate in Dorchester, Roxbury, Brookline, and other towns south and west of Boston furnishes an inexhaustible supply of durable building material for rough work, but which, owing to its coarseness, is unsuited for ornamental work of any kind. The stone is quite variable in different localities, but may, as a whole, be said to consist of a greenish gray groundmass or paste in which are imbedded rounded pebbles of all sizes up to several inches in diameter of quartz, granite, melaphyre, felsite, and a variety of rocks. This composition renders the smooth dressing of the stone a practical impossibility, and it is used only in the rough state, advantage being taken of the numerous joint faces, which in building are placed outward, thus forming a comparatively smooth wall. The stone thus forms a very durable building material and has been used with good effect in several churches and other buildings in and about Boston.

Michigan.—According to Professor Conover* the beds of Potsdam sandstone occurring with frequent outcrops in the northern part of the Upper Peninsula in this State are likely to furnish the largest quantity and the best quality of building material found within the State limits. The stone quarried from this formation at Marquette is of medium fineness of texture, of a light brownish-red color, often curiously spotted or mottled with gray. These gray spots are generally rounded and vary in size, according to Mr. Batchen, from that of a pea to 12 or 18 inches in diameter. These blotched portions are usually rejected in building,

* Report Tenth Census, 1880, p. 227.

although when used they give striking and not unpleasant effects. The spots are stated by the above-mentioned authority to be equally durable with the rest or colored portion. A similar stone is quarried at L'Anse, in Houghton County. Mr. Bachen states these stones were introduced into the Chicago market about 1870. Their chief defects are flint pebbles, which fly out in process of dressing, and clay holes. Both defects can be avoided by proper selection of the stone. In color the Marquette and L'Anse stone are both richer than the Connecticut or New Jersey brownstones, and apparently would prove more durable, although as yet they have been too little used to establish this point to a certainty. Besides the localities mentioned, these stones occur at various places along the lake shore west of Keweenaw Point, and also near the eastern end of the coast of Lake Superior, along the valley of the Laughing Whitefish River and around it. At this latter locality the stone is very hard, compact, heavily bedded, splitting readily into slabs of any required thickness, and is especially suited for heavy masonry.

Minnesota.—According to Professor Winchell* the red sandstones of Fond du Lac are the most valuable of their kind that the State possesses. They are of the same formation as the New Ulm quartzite described below, but were less hardened at the time of their upheaval. The stone is of medium texture and of a brown or reddish color, closely resembling the Connecticut brownstone, but much harder and firmer. A similar rock comes from Isle Royal and Sault Ste. Marie at the eastern end of Lake Superior. At this latter place it is often mottled with gray or greenish. The stone consists almost wholly of quartz cemented with silica and iron oxides. Its crushing strength is said to vary between 4,000 and 5,000 pounds per square inch.

At New Ulm and in other places in Cottonwood, Watonwan, Rock, and Pipestone Counties there occurs a very hard, compact, red quartzite, which has been used to some extent for building purposes, though its intense hardness is a great drawback, but it is practically indestructible and hence valuable. In Pipestone County the rock occurs associated with the beautiful and interesting red pipestone or catlinite, famous on account of its being used by the Indians for pipes and ornaments.

At this point the rock is jasper red in color and very hard, but is beginning to be used for ashler work, producing very striking effects. I am informed by the quarry owners that the entire bed at Pipestone is some 75 feet in thickness and the stone is quarried entirely by means of bars and wedges, no explosives being necessary. A polished slab of the stone of great beauty was exhibited at the Chicago Exposition in 1886.

In Courtland Township, Nicollett County, the same quartzite occurs of a beautiful deep red, almost purple, color. Samples received at the National Museum were found to work with great difficulty but were very beautiful. The same stone, but of lighter color, occurs at

*Geol. of Minnesota, Vol. I.

Sioux Falls, Dak. At Dresbach, in Winona County, there occurs a fine-grained rather soft-light gray stone which bears a close resemblance to the Berea stone of Ohio. It is quarried to some extent and is regarded by Professor Winchell as promising of future usefulness. We have received also specimens of a fine light-pink sandstone from Pine County, which is stated to occur in heavy beds and to be easy to quarry. It is regarded by Professor Winchell as fully equal to the Cleveland, Ohio, freestone. The sandstone occurring at Jordan, Scott County, is of a light color, and while suitable for general building purposes is not regarded as fitted for first-class structures.

Missouri.—So far as the author has had opportunity of examining, the fine light buff subcarboniferous sandstone quarried within a few miles of the town of Saint Genevieve is the most important sandstone in the State.

The quarry face shows a bed 25 feet in thickness of good uniform rock, and blocks 150 feet long, 20 feet wide, and 10 feet thick are said to be obtainable if desired. The stone weathers well in the climate of Saint Louis, but is stated to discolor by smoke.

Near Miami Station, in Carroll County, a fine gray sandstone is quarried, the better grades of which make good building material; but it must be selected with care, as it frequently contains concretionary masses which weather out on exposure.

The Johnson County sandstone is stated to be of good quality in certain situations. It has been used in several important structures in the State, and stands the test of time without scaling, only becoming stained and darkened with age. It is quite light, weighing only 140 pounds per cubic foot when seasoned, or 145–150 when freshly quarried.

Mississippi.—Sandstones of gray and light buff color occur in Jefferson, Rankin, and Tishomingo Counties, in this State. Samples of these were on exhibition at the exposition at New Orleans in the winter of 1884–'85, and from thence were transferred to the national collection at Washington. As shown by these specimens the stones are fine-grained but rather soft and friable, and in no way remarkable for their beauty. Their durability would depend apparently altogether on climatic influences. The writer has no information regarding the uses to which the stones have been put, if, indeed, they have as yet been used at all.

Montana.—A fine light gray Cretaceous sandstone somewhat resembling the well-known stone of Berea, Ohio, occurs in considerable abundance in Rocky Cañon, Gallatin County, and is coming into general use in Boseman. The writer is informed* that it can be obtained in blocks of large dimensions and that it works readily when first quarried, but hardens on exposure, though, like the Ohio stone, it stains with reddish streaks from oxidation of pyrite. A compact red quartzite from near Salesville, west of the west Gallatin, is also coming into use to some extent. A fine, very light stone of uncertain age is also quarried

* By Dr. A. C. Peale, U. S. Geol. Survey.

near Dillon for use in Butte, Deer Lodge County. So recently has the Territory become settled that there has as yet arisen but little demand for other materials than wood for building. The great scarcity of this article in the most thickly settled portions of the Territory, together with the abundance of easy-working, but in so dry a climate durable, sandstone, will doubtless bring about a radical change within a very few years.

New Jersey.—The largest and most extensively worked quarries of stone of any kind in this State are in the Triassic belt of red or brown sandstone which extends from the New York line in a general southwesterly direction across the State to the Delaware River. The principal quarries are in various towns in Passaic, Essex, Hunterdon, and Mercer Counties. The stone, like that of Connecticut and other Triassic areas described, is a granitic sandstone, cemented by iron oxides, silica, and carbonate of lime; the colors varying from light brownish gray to reddish brown. As shown in the Museum collections, the stone is as a rule of finer texture than that of Connecticut, and less distinctly laminated, consequently scaling less readily when exposed to atmospheric agencies. According to Professor Cook,* this stone has been used from an early date in Bergen, Passaic, and Essex Counties for building purposes and for monuments and gravestones, where it has shown good proof of its durability. It has also been very extensively used in New York and neighboring cities. At the quarries, as is usually the case, the surface stone is found more or less broken up and blocks of small size only can be obtained, but the beds become more solid as they are followed downward. At some of the Belleville quarries blocks containing 1,000 cubic feet have been broken out. In one of these quarries over 2 acres have been excavated to an average depth of 60 feet. Some of the quarries, as at Passaic, produce stone of several varieties of color, as light brown, dark brown, and light gray; the fine-grained dark brown is usually considered the best and is the most sought. In several of the quarries trap-rock (diabase) also occurs.

New Mexico.—From the vicinity of Las Vegas Hot Springs have been received samples of light gray, brown, and pink sandstone, of fine texture and apparently excellent quality. They are not as yet much used, owing simply to lack of demand for stone of any kind. A soft, very light gray volcanic tuff occurs at Santa Fé, which may prove of value for building purposes in a dry climate, or one where the temperature does not often fall below the freezing point.

Nevada.—A coarse, gray, friable stone is quarried at Carson, in this State, but it is unfit for any sort of fine work or foundation, owing to its softness and porosity.

New York.—The principal sandstones now quarried in this State may be divided into three groups, belonging to three distinct geological horizons, each group possessing characteristics peculiar to itself and

*Annual report State Geologists, 1881, p. 43.

so pronounced as to be readly recognized thereby. The first of these belong to the Hamilton period of the Devonian formations, and are fine-grained, compact, dark blue-gray stones, very strong and durable.*

They give a pronounced clayey odor when breathed upon, and have been designated *greywacke* by Professor Julien, though popularly known as "bluestones" for their ordinary color. The second group belongs to the Medina period of the Upper Silurian formations. These stones are largely siliceous, of coarser, more distinctly granular texture than the last, and are of a gray or red color. The third and last group belongs to the Potsdam period of the Cambrian formations. Like the Medina stone, they are largely siliceous, and contain a much larger proportion of siliceous cementing material. These are usually light red or nearly white and intensely hard and refractory.

Discussing each group more in detail, it may be said that the "bluestone" district is confined to comparatively narrow limits west of the Hudson River, and mainly to Albany, Green, and Ulster Counties. It begins in Schoharie County, passes to the southeast and enters Albany County near Berne, and from there passes around to the south and southwest across Green, Ulster, and Sullivan Counties, and across the west end of Orange County to the Delaware River and into Pike County, Pennsylvania.†

The typical bluestone belongs to the Hamilton period, and is a fine-grained, compact, tough, and eminently durable rock of a deep dark blue-gray color. Owing to the fact that it occurs usually in thin beds and splits out readily in slabs but a few inches thick, it has been used very extensively for flagging, curbs, sills, caps, steps, etc. Its somber color is something of a drawback to its use for general building purposes. As a rule the quarries are shallow affairs, and the work carried on in the crudest possible methods. At Quarryville, Ulster County, the quarries have been worked for upwards of forty years, and vast quantities of the material removed. The quarries lie in lines along three parallel ledges, which have a general northeast and southwest direction, the beds of sandstone overlying each other from west to east, with strata of slate and hard sandstone between them. The quarries in the easternmost ledge extend about a mile in length, 175 feet in width, and have been worked to an average depth of about 12 feet. In the middle ledge the line of quarries extends over an area about 1½ miles in length, 150 to 500 feet in width, and have been quarried to a depth of from 12 to 20

* Microscopic examination has shown the Devonian sandstones of New York to consist chiefly of "angular to subangular grains of quartz and feldspar, with their interstices occupied by smaller grains of magnetite, scales of chlorite, and particularly short fibers of hornblende interlacing the grains of the other constituents. The result is an 'argillaceous sandstone,' flagstone, or greywacke, peculiarly compact and impermeable, which has retained its fresh condition to an extent which could not otherwise have been expected from an aggregate so liable to ready decomposition." A. A. Julien in Proc. A. A. A. S., Vol. XXVIII, 1879, p. 372.

† Report of the Tenth Census, Vol. x, 1880, p. 130.

feet. Quite heavy beds occur in some of the quarries, and the joints allow blocks of very large size to be obtained. In the western ledge the quarries are in a line some 1,000 feet long by 150 wide, and are worked to an average depth of about 12 feet. The total thickness of the layers in this region is from 4 to 20 feet, and the stripping from 6 to 17 feet in depth. In working the quarries but little capital is required beyond the value of the necessary tools, they being commonly leased and royalty paid at the rate of one-half cent per square foot of stone quarried. The larger size of blocks have dimensions of about 15 by 8 feet, though some 20 by 15 feet have been taken out. At the time of taking the census in 1880 there were upwards of one hundred and fifty quarries within the bluestone district as given above. All, however, agree so closely with those of Quarryville, that further description seems unnecessary.

The quarry district in the Medina sandstone extends from Brockport, Monroe County, to Lockport, Niagara County. The stone is, as a rule, moderately fine-grained in texture, hard, and of a gray or red color, the red variety being most used for building purposes, while the gray is used in street-paving. The red variety has a bright and pleasing appearance; both red and gray are sometimes used together, with good effect. Most of the stone buildings in Lockport and Buffalo are of the Medina stone. The most important feature of the stone is, however, its adaptability for street-paving, in place of the usual granite or trap blocks. It is said that the sandstone blocks have the advantage of not wearing smooth, as do the granites and traps, while at the same time they are nearly, if not quite, as durable.

The stratum of quarry rock is put at about 30 feet in thickness, the different layers of which vary in thickness from 18 to 30 inches.

Three miles south of the town of Potsdam, in Saint Lawrence County, the Raquette River cuts across the Potsdam formation, and quarries are worked along the banks of the stream. The outcrops at this point are some 2 miles in width from north to south. In the quarry the strata dip to the south at an angle of about 45°, the beds increasing in thickness somewhat from the top downward, until at a depth of 40 feet they are some 2 or 3 feet in thickness. In color the stone is light-reddish or reddish-brown, and though, when first quarried, soft enough to work readily, becomes most intensely hard on seasoning. It is very highly silicious and is, without doubt, one of the most durable of all our sandstones. Owing to its hardness it has been as yet but little used for general building purposes. Columbia College, in New York City, is one of the most important buildings yet constructed from it. At Fort Ann, in the same county, the stone is much lighter in color and composed of almost pure silica, there being an almost entire absence of iron oxides in the cementing material. The stone is, as a consequence, extremely hard, but tough and durable.

North Carolina.—The narrow belt of Triassic sandstone already men-

tioned as passing through this State furnishes fine, compact, light and dark reddish-brown stone of a quality not at all inferior to any of that in the more Northern and Eastern States. Through the energy of the late Professor Kerr the museum has received a very full assortment of these, and we can speak of their qualities from a personal examination.

At Wadesborough, in Anson County, the stone lies in beds from 2 to 10 feet in thickness, which are inclined at an angle of about 25° from the horizontal. It is of fine, even grain, quite massive, and of dark brown and reddish colors. Heretofore it has been used chiefly for railroad work and for steps and general trimming purposes in Charlotte and Wilmington, but is worthy of a wider application. Within the past year steps have been taken to introduce it into the markets of Washington and other of our eastern cities. The chemical composition and crushing strength are given in the tables.

The Sanford stone is of a brown color and is said to lie in the quarries in nearly horizontal strata from 1 to 5 feet in thickness. The stone from near Egypt is quite similar in appearance. Near Durham it becomes in part of a gray color, but otherwise is little different. This stone has been used in Raleigh for upwards of thirty years and shows itself to be strong and durable.

Ohio.—According to Professor Orton* those rocks of the sub-Carboniferous period called by the Ohio Geological Survey the Waverly group, are the most important as to production of building stone in the geological scale of this State. The following section shows the arrangement of this formation:

1. Maxville limestones, in patches.
2. Logan group.
3. Cuyahoga shale.
4. Berea shale.
5. Berea grit.
6. Bedford shale.

Of these, number 1 occurs but seldom. Number 2 consists of fine-grained sandstones overlying and alternating with massive conglomerate in the central and southern part of the State. In thickness about 100 feet. The Waverly conglomerate is a member of this group. Number 3, about 300 feet in thickness, is a blue argillaceous shale in many parts of the State, but in many places contains scattered courses of sandstone of great value. Number 4 is from 10 to 30 feet thick, and number 5 is the Berea grit, the great quarry rock of northern Ohio. This formation is from 10 to 75 feet in thickness, and extends in a belt from Williamsfield, in the southeastern corner of Ashtabula County, westward into Erie County, and thence nearly directly southward in Adams County to the Ohio River. The stratum of sandstone where it is best developed consists of heavy sheets, with often a course at the top of thin, broken layers, called *shell rock*, and of no value for building stone. Number 6 is from 10 to 100 feet in thickness, and furnishes no building stone, excepting in Cuyahoga County, where it yields the well-known "Euclid bluestone."

* Report of the Geological Survey of Ohio, Vol. V, p. 578.

The Berea grit, as quarried for building purposes, may be described as a fine-grained homogeneous sandstone, of a very light buff, gray, or blue-gray color, and very evenly bedded, the individual sheets varying from a few inches to 10 or more feet in thickness. In many places this evenness of bedding is especially remarkable, as in some of the quarries of Trumbull County, where blocks of stone 10 feet square and only 1½ inches thick have been extracted, and with surfaces so smooth and straight that a straight-edge laid upon them would touch at every point. Slabs but 1 or 2 inches in thickness are said to have such strength that they go into general use without question. In one case a strip 150 feet long, 5 feet wide, and but 3 inches thick was reported as raised intact from the quarry bed. The various layers, although closely compacted, are, however, perfectly distinct, adhering to one another "scarcely more than sawn planks in a pile."

Like many of the sandstones of this horizon, the Berea grits contain but little cementing material, the various particles being held together mainly by cohesion induced by the pressure to which they were subjected at the time of their consolidation. They are, therefore, soft, working readily in any direction, and are particularly sought for carving.

This property also renders the stone of especial value for the manufacture of grindstones, since the presence of a cement will nearly always cause a stone to glaze and its cutting power be thereby nearly if not quite destroyed. Unfortunately the Berea stone nearly always contains more or less sulphide of iron (pyrite) and needs to be selected with care. The best varieties will usually become yellowish on long exposure, but this is not in all cases injurious. Indeed, this property of "mellowing with age" is now claimed as one of the good qualities of the stone. When, however, the pyrite occurs in such quantities as to produce by its oxidation unsightly blotches its presence is, of course, objectionable.

The principal quarries of the stone at present writing are situated in the towns of Amherst, Berea, East Cleveland, Ilyria, and Independence in Lorain and Cuyahoga Counties.

At Amherst the quarries are located in a series of ledges which were once the shore cliffs of Lake Erie. The elevated position of the stones is a great advantage, since the light and uniform color seems due to the fact that this elevation produces a free drainage, and the stones have been traversed by atmospheric waters to such a degree that all processes of oxidation which are possible have been very nearly completed. The stone here as elsewhere varies considerably in character and solidity within limited distances. The following section of one of the Amherst quarries is given by Professor Orton:

	Feet.		Feet.
Drift material	1 to 3	Grindstone	2
Worthless shell-rock	6 to 10	Building and grindstone	10
Soft rock for grindstones only	12	Building stone	4 to 7
Building stone	3	Building stone or grindstone	12
Bridge stone	2		

Nearly all the quarries exhibit this diversity of material, although the order of arrangement is not always the same. The colors are light buff and bluish gray, the buff stone occurring above the line of perfect drainage and extending down as far as the 2 feet of bridge stone, forming a total thickness of 27 feet. In most of the Amherst quarries the relative amount of buff stone is greater. Difference in color and texture has given rise to various local names which may be mentioned here. The colors are denominated simply by "blue" and "buff." The regularly and evenly stratified stone is called "Split rock;" that in which the stratification is irregular and marked by fine transverse and wavy lines is called "Spider web," and the homogeneous stone showing little or no stratification is called "Liver rock."

As regards composition the stone contains usually about 95 per cent. of silica with small amounts of lime, magnesia, iron, oxides, alumina, and alkalies. Analysis has shown them to contain from 5.83 to 7.75 per cent. of water when first taken from the quarry, and from 3.39 to 4.28 per cent. when dry. The quarries can be operated only about eight months of the year owing to the injury caused by freezing when the stone is full of its quarry water.

In the town of Berea nearly 40 acres of territory have been quarried over to an average depth of 40 feet. The stratum is 65 to 75 feet in thickness, the individual sheets varying from 2 inches to 10 feet. The stone is as a rule a little darker than the Amherst bluestone. It is used mostly for building purposes, though grindstones and whetstones are also manufactured quite extensively.

Great care must be taken here in selection of material, as the sulphide of iron is often present in such amount as to shortly disfigure the surfaces and even discolor the stone in the courses below.

The well known "Euclid bluestone" is obtained from the Bedford shale formation in Newburgh and Euclid, in Cuyahoga County. The stone differs from the Berea in being of finer and more compact texture, and of a deep blue gray color. Like the Berea stone, however, it unfortunately contains considerable quantities of pyrite, and, as a general thing, is not a safe stone for other than bridge work and foundations or flagging, for which last purpose it is eminently suited. Even when free from pyrite it does not weather in uniform colors, and needs always to be selected with great caution.

In the vicinity of Marietta and Constitution, in Washington County, a fine grained buff and blue gray sandstone, belonging to the Upper Coal measures series, is quite extensively quarried for grindstones and building purposes. Different portions of the stratum furnish stone of all varieties of texture for wet grinding, and the grindstones are shipped to all manufacturing points in the United States. The principal market for the building-stone is in Marietta and various towns along the Ohio River.

At Piketown there is quarried a very pretty, fine grained brown-

stone, soft and easy to work, and apparently fairly durable. It has been used in some of the finest stone fronts in Columbus, in this State.

According to Professor Orton,* however, the stone is brown only on the outcrop, and a few feet from the surface assumes a dark blue-gray color, and loses its value as an ornamental stone, since it contains a large amount of soluble iron protoxide, which produces bad discoloration on exposure. An analysis of this stone is given in the tables.

Oregon.—Two miles south of Oakland, Douglas County, in this State, there occurs an extensive deposit of a fine, dark blue-gray sandstone, which changes to a drab color on exposure. It occurs in layers of 17 to 36 inches in thickness, parted by shaly seams, and is readily quarried by means of wedges. Quarries were opened in 1879, but have not been extensively worked as yet. A fine-grained sandstone, said to be suitable for either building or ornamental work, also occurs about 14 miles from Portland, in Clackamas County. It has been quarried since 1866, and used in some prominent structures in Portland.

Pennsylvania.—The belt of Triassic sandstones passing through southwestern Pennsylvania is described as beginning at the west bank of the Hudson River and extending in a broad belt from the Bay of New York to the base of the first ledges of the Highlands, being bounded on the northwest by this chain and its continuation. To the southwestward it traverses New Jersey, Pennsylvania, Maryland, and, in a somewhat interrupted manner, Virginia and part of North Carolina, its total length being not less than 500 miles, and of a width varying from 10 to 50 miles. The principal quarry in this formation in Pennsylvania is situated on the south side of a hill in Hummelstown, Dauphin County, the stone dipping to the north at an angle of about 40° and the ledge being about 85 feet in thickness. The rock is evenly bedded, the courses varying from 3 to 10 feet in thickness, the joints regular and from 4 to 40 feet apart, so that blocks of any practicable size can, it is said, be obtained. The texture is about medium fineness, and the color a deep bluish brown, slightly purple. The topmost layers are, however, of a reddish brown color, closely resembling the Portland stone. The stone compares very favorably with any of the Triassic stones, its chief defect, so far as the author has observed, being occasional clay holes, which sometimes have an unpleasant way of making their presence known in unexpected and undesirable places. The Hummelstown stone is now in very general use in all our principal Eastern cities.

Stone from the same formation and differing, if at all, only in slight color and texture peculiarities is quarried more or less in other towns along the belt, particularly Goldsborough, Reading, Bridgeport, and several towns in Bucks County.

The Carboniferous sandstones of Pennsylvania are little quarried excepting for local use, although occasionally of good quality. Near

Op. cit., p. 599.

Pittsburgh and Allegheny, and other towns in Allegheny County, there are many quarries which produce gray stone of medium texture of apparently good quality. They are said, however, to weather unevenly, owing to the presence of calcareous matter, and to be very sensitive to frost when first quarried. In several places in Westmoreland County the stones of this age are of a gray, reddish, or brownish color, fine grained and of good quality. They are used to some extent for building and also for flagging and paving.

The sub-Carboniferous formation, so valuable in Ohio for the building stone they supply, are in this State of little value, or at least up to date have been but little quarried for purposes of construction. At Venango, in Franklin County, a fine-grained, evenly-bedded buff stone, somewhat resembling the buff varieties of the Berea grit, is quarried for sidewalks and buildings in the near vicinity. Other quarries are located at Titusville, and also at Uniontown, Altoona, and Scranton.

Aside from the Triassic stones, the most important sandstones at present quarried in the State are from the Devonian formations. In several towns in Pike, Carbon, Luzerne, Wyoming, Susquehanna, and other counties, stones belonging to this formation, of a fine, compact texture and dark blue-gray color, are quite extensively quarried. So far as can be judged from the material examined, this is one of the most valuable stones in the State for building as well as for flagging purposes. The Wyoming County stone is known to the trade as "Wyoming Valley stone," and is in considerable demand. It agrees very closely in general appearance with much of the New York bluestone already described.

Tennessee.—Fine-grained light pink and coarse buff sandstones occur at Sewanee, in this State, and coarse gray at Parksville. The museum is in possession of no information regarding the extent to which these are used or their weathering properties.

Texas.—So far as is yet known this State produces but little of value in the way of sandstones. In Burnet County there are coarse dark-brown and red Lower Silurian (?) sandstones that may do for purposes of rough construction in the near vicinity. A fine, light buff Carboniferous stone, closely resembling the light-colored Ohio sandstone, occurs also at Mormon Mills, on Hamilton Creek, in this same county. A very light gray distinctly laminated stone occurs at Riverside, in Walker County, but to judge from the sample in the Museum collection it is of very poor quality. A fine-grained light buff stone, studded with fine black points, is found at Ranger, in Eastland County, and several varieties of apparent good quality, ranging in color from light buff to deep ferruginous red, in Parker County. So far as the curator can learn none of these are quarried to any great extent.

Utah.—No sandstones of any kind are now regularly quarried in this Territory, though there is no lack of material. At Red Butte, near Salt Lake City, there occur inexhaustible supplies of Triassic sandstone of

various shades of red or pink color. These have been used to some extent in Salt Lake City.

Virginia.—The belt of Triassic sandstone upon which the quarries of Seneca Creek, in Maryland, are situated extends across the Potomac River in a southwesterly direction as far as the Rapidan River, in Virginia. So far as the curator is aware, but a single attempt has been made to quarry this material. On the line of the Manassas and Virginia Midland Railroad, at a point not far from Manassas, quarries were opened about 1868, and up to the time of the taking of the tenth census some 400,000 cubic feet of material had been moved. As represented in the collection of the National Museum the stone is fine-grained, light reddish brown in color, closely resembling the lighter varieties from Seneca Creek, from which, however, it differs in being softer and a trifle more absorbent. The quarries are represented as being situated near the top of a low eminence, the strata being nearly horizontal, with but a slight dip toward the south. The surface only of the ledge has been quarried and this to a depth of about 20 feet. The beds vary from 1 to 6 feet in thickness and are separated by a greenish shale.

No other sandstones of any importance are at present quarried within the State limits, although formerly the beds of light gray or buff Juro-Cretaceous stone in the vicinity of Aquia Creek were worked to a considerable extent to furnish material for the public buildings in Washington City. It required but a few years, however, to demonstrate the entire unfitness of this material for any sort of exposed work, and the quarrying has therefore been discontinued.

Washington Territory.—On Chuckanut Bay, adjoining Bellingham Bay, in this Territory, is a very large deposit of a blue-gray Carboniferous sandstone that has been quarried to furnish material for the United States custom-house at Portland, Oregon, and for use in other towns on Puget Sound. The quarry is situated on a bluff which is represented as from 50 to 150 feet in height and about a mile in length. The supply of workable material is inexhaustible and it is said blocks 30 feet in length can be obtained without a flaw. The quarries are so situated that vessels of large size can be brought directly to the pier for loading.

Wisconsin.—The sandstones of this State, so far as we have had opportunity of observing, are mostly of a very light color and uninteresting appearance, such as are not likely to ever be in demand for other than local uses. Near Darlington, La Fayette County, there is stated by Professor Conover to occur a large outcrop of Silurian sandstone, of a brown and brick-red color passing into grayish-pink. This is regarded by the above-named authority as the best-appearing stone in that part of the State, though little quarried, owing to the large amount of worthless stone associated with it and the cost of transportation. The Potsdam formations in the region of Lake Superior are regarded as capable of furnishing desirable sandstones, yellowish to deep brown in color.

The chief defect in these is the presence of numerous and large clay holes, necessitating great care in selecting the material. Many exposures, as at Douglas and Bayfield Counties and on the Apostle Island are so situated that the quarried material could be shipped directly upon vessels with but little carting.

West Virginia.—According to Professor Orton this State abounds in building stone, of which, however, but a small percentage is strictly first-class material. With the exception of one or two points on the Baltimore and Ohio Railroad, none is quarried for the general market. Near Rowlesburgh, on the banks of the Cheat River, there occurs a deposit of fine deep blue-gray Devonian sandstone that has been quarried to the depth of 40 feet, over an area of perhaps one-fourth of an acre. The quarry lies at the very foot of the mountains, and the amount of stripping is accordingly very great and continually increasing. The stone resembles very closely the Devonian bluestone of New York, especially that quarried in Chenango County and the lighter varieties of Ulster County. It is said to be highly esteemed and very durable.

According to the same authority the Kanawha River and its tributaries throughout the whole region about Charleston are walled with rock, and quarries are possible everywhere, but not all of the stone is equally good. The engineers employed in the erection of the Government building at Charleston, after thoroughly testing all the prevailing varieties, finally decided upon that from a comparatively thin bed, 6 to 10 feet in thickness, that forms the cap to the Mahoning sandstone formation near Charleston. This rock is light gray, siliceous, somewhat conglomeritic, but strong and eminently durable. Frost seemed to have no effect upon it, and no efflorescence is perceptible upon exposed blocks. Continual vigilance must, however, be exercised in selecting stone, as much of it contains shaly pockets and pyritiferous seams. The bluestone from this same region, which has been largely used in the Government works of improving the Kanawha River, is a strong stone, experiments having shown it to have a crushing strength of about 14,000 pounds per square inch of surface, but much of it is pyritiferous, and great care must be used in selection. This stone has been used in one or two important buildings, and with very bad results, it beginning to discolor and exfoliate within two or three years.

At Grafton, in Taylor County, a light-gray sandstone belonging to this same formation (Carboniferous) has been extensively quarried for railroad work. The quality of the stone is said to be good, and it is strong enough for the heaviest work. The thickness of the stratum here is from 150 to 200 feet, and the amount of stone available is beyond computation, there being literally mountains of it. There are several other localities in this region where sandstone is quarried for local purposes, but which can not be noticed here.

(2) VOLCANIC FRAGMENTAL ROCKS. TUFFS.

(*a*) Definition, Origin, and Composition.

Under the general name of tuff it is customary to include those fine-grained fragmental rocks formed by the consolidation of volcanic detritus, such as ashes, sand, and lapilli, or by the breaking down and reconsolidation of volcanic rocks of various kinds. This consolidation, according to Geikie,* may have taken place either under water or on dry land; in either case they are as a rule distinctly stratified. Those of the tuffs which are formed from Tertiary or post-Tertiary erupted materials are naturally but slightly consolidated, soft and easy to work. It follows, almost as a matter of course, that they will absorb a proportionally large amount of water, and hence be less durable in the exceeding trying climate of the Eastern and Northern States.

The older tuffs are often so firmly compacted that recourse to the microscope must be had to determine their fragmental nature.

(*b*) Varieties of Tuffs.

According to the nature of the lava, from the disintegration of which the tuffs are formed, they are designated by special names. *Rhyolite* tuff is composed of disintegrated rhyolite; *trachyte* tuff of disintegrated trachyte, etc.

(*c*) Localities and Uses.

These rocks are very abundant throughout our Western States and Territories, but are scarcely at all used for building purposes, owing in part to the newly settled condition of the country in which they occur and in part to their state of incomplete consolidation. They are, however, soft, and easy though rather unsafe working stones, owing to lack of definite rift and grain, often plucky fracture, and the presence of numerous dry seams and clay holes. They are, moreover, light, frequently weighing only from 75 to 100 pounds per cubic foot, though moderately strong. When not exposed to too wide variations of climate they must prove very durable. Although no systematic experiments have as yet been made, appearances indicate that they would prove extremely refractory in case of fire.†

They present a great variety of colors; white, gray, pink, red, lavender, salmon, green, and even black, are common.

With these qualities there seems no reason for their not proving a valuable material in dry climates for all kinds of structural purposes where only the rougher kinds of finish are employed, their textures being almost invariably such that they will not polish.

The light gray and pink rhyolite tuff occurring in Douglass County, Colo., has been used in the construction of the Union Depot, Windsor Hotel, and other buildings in Denver.

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* Text-Book of Geology, p. 164.

† Newberry states that the tuffs found near Challis, Idaho, are of "considerable importance as they are extensively used in place of fire-brick for lining lead-smelting furnaces," being very refractory and easily dressed into shape with an old ax.—Trans. N. Y., Acad. Sci., Dec., 1881.

The stone has already been alluded to under the head of sandstones. It may rank as a fairly durable material, but contains clay holes and other imperfections that unfit it for fine work of any kind. The Museum has received other samples of tuffs of various kinds from California, New Mexico, Idaho, and Utah, but they are not at all used at present, and their fitness or unfitness for any sort of building purposes is a problem for the future to decide. From near Phœnix, Ariz., has been received a tuff consisting only of the firmly compacted shreds of volcanic glass or pumice and that is stated to have been used locally to some extent.*

Although so little used in this country, tuffs are very generally employed for building purposes in many foreign localities. They are found abundantly in the volcanic districts of central France, and in the Haute-Loire, where they have been used in the construction of churches and dwelling-houses. The so-called "peperino" of the campagna of Rome and Naples, is a tuff formed by the consolidation of volcanic ashes, and has been used in some of the buildings of these cities. It was also used in the construction of the houses of Herculaneum and Pompeii.†

Rhyolite tuffs are, as I am informed by Signor Aguileria, very largely used for general building in certain parts of Mexico, the climate being such as to render almost any material very durable. There is now a large collection of these stones in the National Museum.

(3) ARGILLACEOUS FRAGMENTAL ROCKS. THE SLATES.

(*a*) Composition and Structure.

Ordinary clayslate consists of consolidated clay. It is therefore classed as a fragmental rock, although microscopic examination has shown that it frequently contains crystalline matter, and that the rocks pass by insensible gradations into what are called argillitic mica schists. Microscopic examination of slates from Littleton, N. H., by Hawes,‡ showed them to consist of a mixture of quartz and feldspar in fragments as fine as dust. There is also present a "considerable quantity of some amorphous coaly matters," and many little needles of a brightly polarizing substance which is probably mica. The clayslate of Hanover, N. H., was found by the same authority to contain many minute crystals of garnet and staurolite. An examination of some clayslates from the Huronian region of Lake Superior, by Wichmann,§ showed them to consist of a "colorless isotropic groundmass in which the other constituents are apparently imbedded, whilst throughout are found dust-like particles of a deep gray color, which represent the chief constituent, and consist probably of clay substances, the greater part of them probably of kaolin." Besides these constituents there were also a few quartz and feldspar particles, scales of hydrated oxide of iron, flakes

* See Am. Jour. Sci., Sept., 1886, p. 191.

† Hull: Building and Ornamental Stones, p. 283.

‡ Geol. of New Hampshire, Vol. III, p. 237.

§ Quar. Jour. Geol. Soc., London, XXXV, 1879, p. 158.

of coal, minute tourmalines, and mica fragments. The Maine slates as observed by the author contain quite large flakes of greenish mica, and many quartz and carbonaceous particles. As a rule the dark color of slate seems to be due to these carbonaceous particles, since they are very abundant in the dark varieties, as those of West Bangor, Pa., and almost entirely lacking in the light-greenish varieties, as those of Castleton and Fairhaven, Vt. The red slates of Granville, N. Y., are made up of a groundmass of impalpable red dust in which are imbedded innumerable quartz and feldspar particles all arranged with their longer axes parallel with the cleavage direction of the slate.

Although slate is undoubtedly a sedimentary rock, its remarkable cleavage property is in no way connected with its bedding, as might at first be supposed, but as shown by Sorby,* Daubrèe,† and others, is caused by pressure acting in a direction at right angles with this cleavage plane, and which may or may not correspond with that of its bedding.

(*b*) Uses of Slate.

Besides for roofing purposes, slates are used for billiard-tables, mantels, floor-tiles, steps, flagging, and in the manufacture of school-slates. For the last-named purpose a soft, even-grained stone is required, and almost the entire supply is at present brought from Pennsylvania and Vermont.

Of late years the business of marbleizing slates for mantels and fireplaces has become an important industry. All kinds of stones can be imitated by this process, but that most commonly seen is the green verd-antique marble and the variegated marbles of Tennessee. Like many counterfeits, however, the work is too perfect in execution, and need deceive none but the most inexperienced.

The following table gives the various sizes of slate made for roofing, and the number that are necessary for a "square," *i. e.*, a space 10 feet square, or containing an area of 100 square feet:‡

Size.	No. of slates to a square.	Size.	No. of slates to a square.	Size.	No. of slates to a square.
Inches.		*Inches.*		*Inches.*	
24 by 14	98	18 by 9	213	10 by 7	588
24 13	105	18 8	230	10 6	686
24 12	114	16 10	222	10 5	823
24 11	124	16 9	246	10 4	1,039
24 10	138	16 8	247	9 8	600
22 13	116	16 7	316	9 7	686
22 12	126	14 9	300	9 6	800
22 11	138	14 8	327	9 5	960
22 10	151	14 7	374	9 4	1,200
20 12	141	14 6	436	8 6	960
20 11	154	12 8	400	8 5	1,152
20 10	169	12 7	457	8 4	1,440
20 9	188	12 6	570	7 5	1,440
18 11	174	12 5	640	7 4	1,800
18 10	192	10 8	514	7 3	2,400

* Edinburg Philosoph. Jour., IV, 1853, p. 137.

† Geologie Experimentale, p. 391.

‡ From Rep. D 3, Vol. I, p. 142, Second Geol. Sur., Pennsylvania.

(c) SLATES OF THE VARIOUS STATES AND TERRITORIES.

Georgia.—Slates sufficiently cleavable to be applicable for roofing purposes are stated * to exist in great quantities along or near the line of contact between the Silurian and Metamorphic Groups, near the Cohutta, Silicoa, Pine Log, and Dug Down Mountains in this State. The most noted locality for roofing slates is on the eastern side of Polk County. The outcrops are in steep hills and are apparently of great thickness. They have been worked quite extensively at Rock Mart, though in a crude and itinerant manner, since as early as 1859, the material being shipped chiefly to Atlanta and neighboring towns. Other dark-colored slates are found in Bartow, Gordon, Murray, and Fannin Counties, while buff and light green varieties are found in large quantities in the northwestern portion of Bartow County. None of the above are to be found in the general market, nor have we received samples of the same.

Maine.—According to Dr. Jackson † inexhaustible quantities of slate occur along the banks of the Piscataquis River from Williamsburgh to Foxcroft. Professor Hitchcock ‡ also reports excellent sites for quarries of this material as occurring on the Kennebec River from Patten to Pleasant Ridge. At various times quarries have been opened at different points in these localities, but the principal ones at this time are in the towns of Monson, Blanchard, and Brownville, Piscataquis County. The slates here produced are all of a blue-black color and are reported by Mr. J. E. Wolff as of most excellent quality, being hard, with a fine cleavage surface, not subject to discoloration, and giving forth a clear ringing sound when struck. Although seemingly susceptible of being used for all purposes to which slates are usually applied, they are at present utilized almost altogether for roofing.

Maryland.—The principal quarries of slate in this State are in Harford County, adjoining Pennsylvania. The ridge upon which the quarries are situated extends across the State line into York County, where several other quarries are worked within a radius of about 1 mile. As the Harford and York County stones are practically identical we will reserve a complete description of their qualities until we come to speak of the latter. Other quarries were formerly worked in the town of Ijamsville, in Frederick County. The stone here is of a blue black color and is represented to be of good quality, but for some reason unknown to the writer the quarries are no longer worked.

Massachusetts.—Although, as already noted, slate was one of the stones to be earliest quarried in eastern Massachusetts, the material was of such a nature as to be of little value except for rough construction, and hence the industry has always remained of slight importance. The only quarries now worked from which slate suitable for roofing or other

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* Commonwealth of Georgia, p. 137.

† Second Report on Geology of Maine, 1838, p. 116.

‡ 4th Ann. Rep. Geol. and Nat. Hist. of Maine, 1862, p. 429.

fine work can be obtained are at Lancaster, in Worcester County. This quarry is stated by Marvin* to have been opened by a Mr. Flagg over a century ago, and the slates were in use as early as 1750 or 1753 (ante, p. 291). Owing to lack of favorable transportation facilities the work was discontinued more than fifty years since, and it was not till 1877 that it was recommenced. The slate though porous is said to hold its color well and to be durable. Another outcrop of slate of good quality is said to occur about 1 mile north of Clinton, in this same county. It is not, however, as yet quarried.

The clay slates occurring in the vicinity of Boston and Cambridge have long been used for road materials, but for purposes of construction only to a slight extent. They are not sufficiently fissile for roofing purposes. The stone is regarded by Professor Shaler as of great value for rough building, as it is durable, easily quarried, and very effective when placed in a wall. The Shepherd Memorial Church in Cambridge is the only building of importance yet constructed of this material.

Minnesota.—At Thompson, Carlton County, where the Saint Paul and Duluth Railroad crosses the Saint Louis River, there occurs, according to Prof. N. H. Winchell† an inexhaustible supply of hard, black, and apparently eminently durable slate suitable for roofing, school-slates, tables, mantels, and all other purposes to which slate is usually applied. Quarries were opened here by the railroad company in 1880, but for some unknown reason were discontinued before any of the stone had been put upon the market. The deposit is regarded as of especial value by Professor Winchell, inasmuch as it is the most western known in the United States, and its close proximity to the railroad renders the transportation of the quarried material a matter of comparative ease.

Michigan.—An extensive deposit of Huronian slates occurs in the northwestern portion of the northern peninsula of this State, principally in the towns of Houghton, Marquette, and Menomonee. But a small portion of the entire formation will furnish material sufficiently fissile, homogeneous, and durable for roofing purposes; nevertheless the supply of good material is so abundant as to be practically inexhaustible. At L'Anse the beds extend down to the lake shore, but are badly shattered, not homogeneous, nor of sufficient durability in this immediate vicinity to be of value. Good roofing slate is, however, found about 15 miles from L'Anse, on the northwestern side of the Huron mountain range, and about 3 miles from Huron Bay, where extensive quarries have been opened. The stone here is susceptible of being split into large, even slabs of any desired thickness, with a fine silky, homogeneous grain, and combines durability and toughness with smoothness. Its color is an agreeable black and very uniform. Several companies have located their quarries along the creek which runs parallel with the strike of the slate, and a tramway about 3½ miles in

* History of Lancaster.

† Preliminary Rep. on the Building Stones, etc., of Minnesota, 1880, p. 17.

length has been built down to the bay, where a dock has been erected for the unloading of vessels and for the convenient shipment of the material.*

New Jersey.—The belt of Silurian slates and shales extending in a northeasterly and southwesterly direction entirely across the northern part of this State includes several quarriable areas, but which have up to the present time been utilized only to a limited extent. Quarries have been worked at La Fayette and Newton, in Sussex County, and also at the Delaware Water Gap in Warren County. The product of these is represented by Professor Cook† as of good quality and suitable not only for roofing material, but also for school slates, tiles, mantels, etc.

New Hampshire.—Professor Hitchcock states‡ that the only formation in this State likely to furnish good roofing slates is the Cambrian range along the Connecticut River. There have been quarries upon this belt in the towns of Littleton, Hanover, and Lebanon, but they have not now been worked for several years. The stone is stated to be not quite equal to that of Maine and Vermont, but certain portions of it might be utilized locally to good advantage, as for tables, platforms, curbs, and flag-stones. In Littleton the band of rocks suitable for working is nearly an eighth of a mile wide and has been opened at two localities. The strata are vertical and the outcrops on a hill where good drainage can be had to a depth of a hundred feet. The stone is soft, apparently durable, and of a dark-blue color, but does not cleave so thin as the slate from Maine. At East Lebanon the valuable part of the slate-bed is 30 feet in width. The stone does not split sufficiently thin for roofing, but can be utilized to good advantage for chimney-pieces, table-tops, and shelves; also for sinks, cisterns, flooring-tiles, etc. The waste material was formerly ground and bolted into slate flour.

New York.—According to Professor Mather§ "The roofing-slate formation of this State ranges through Rensselaer County from 2 miles west of Lebanon Springs to the northeast corner of Hoosic; thence north in Washington County through the towns of White Creek, Jackson, Salem, Hebron, Granville and Hampton; and thence an unknown distance into Vermont." A range of roofing slate supposed to be the same as that of the Hoosic quarries extends also through the towns of Canaan, Austerlitz, Hillsdale, Copake, Ancram, and Pulver's Corners, in Columbia County. The most important quarries at present worked are in the towns of Hampton, Middle Granville, Granville, and Salem, in Washington County, and Hoosic, in the northeastern part of Rensselaer County, though there are said to be numerous promising localities in different parts of the range which have never been opened. Professor Mather estimates the quantity of slate suitable for roofing in the range as above given to be "sufficient to supply a nation's wants for ages." The same

* Geol. of Michigan, Vol. III, Part I, p. 161.
† Ann. Rep. State Geologist of New Jersey, 1881, p. 66.
‡ Geol. of New Hampshire, Vol. III, p. 81.
§ Nat. Hist. of New York, Geology, 1843, part 1, p. 420.

authority states that these slates, though softer than the imported Welsh slates, are equally good. They are reported by Doctor Fitch* as occurring in a great variety of colors, passing through almost innumerable shades of gray, brown, black, blue, green, yellow, purple, and red. This last variety, I am informed by Professor Smock, is the most highly valued, bringing about three times the price of the black. It is quarried extensively at North Granville, near the Vermont line, and is regarded as the best of its kind produced in this country. According to Doctor Fitch† the bed of red slate, although at present quarried in only one or two towns, "occurs in a nearly continuous line through the whole length of the slate formation from Vermont to New Jersey." But a small part of this, however, is capable of furnishing material of good quality. Many attempts have been made, as I am informed by Professor Smock, to open quarries in the central and western half of Washington County with but indifferent success, those now worked being almost altogether in the northeast corner of the county, near the Vermont line.

Pennsylvania.—The narrow slate belt already noted as occurring in Harford County, Md., crosses the State line into the extreme eastern portion of York County, in Pennsylvania, and thence sweeps around in a gradually narrowing curve to the Susquehanna River, appearing again on its eastern bank, in Fulton Township, Lancaster County, where it finally disappears. It is from this narrow belt, at its greatest dimensions less than a mile wide and scarcely more than six miles long, that has been quarried for many years the justly celebrated blue-black "Peach Bottom slate." The stone is stated to rank very high for strength and durability. It is tough, fine, and smooth in texture, and is stated not to fade on exposure, buildings on which it has been exposed for upwards of seventy-five years still showing it fresh and unchanged. An analysis of this slate is given in the tables. The principal quarries now worked are at Bangor and West Bangor, York County, in Pennsylvania, and at adjacent points just across the line in Maryland.

The Utica and Hudson River slate formation, in which lie the largest and most important quarries of slate at present worked in this country, extends in a belt of from 7 to 12 miles in width throughout the entire northern parts of Northampton and Lehigh Counties, and thence in a gradually though unevenly narrowing band in a general southwesterly direction through Berks, Lebanon, Dauphin, Cumberland, and Franklin Counties, whence it passes into Maryland. But a very small portion of the thus roughly delineated area is of such a nature as to furnish stone for economic purposes. The quarries at present worked, beginning with the northeastern part of Northampton County, are situated at East Bangor, Bangor, Pen Argyl, Chapman's Station, Catasauqua, Allentown, dale, Lynnsport, and Stinesville.

The geological character of the beds and the details regarding the quarries have been described with considerable detail by Mr. R. H. San-

* Trans. N. Y. Agr. Soc., 1849, p. 830. † *Op. cit.*, p. 834.

ders,* and which it seems unnecessary to repeat here. The slates produced are all of a blue or blue-black color, and are used for all purposes to which such material is usually applied. In the manufacture of school-slates a softer and finer grade of material is requisite than for most other purposes. These are split from the block in the same manner as roofing-slates, their edges trimmed with a circular saw, and the faces smoothed by a drawing-knife, after which they are rubbed down with a cloth and fine slate dust till the surface is smooth and even. They are then mounted in wooden frames and packed for shipment.

The following statistics of shipments from the Slatington region for the year 1882 will give some idea of the magnitude of the industry:†

Squares of roofing slates, 100,000; cases of school slates, 29,704; cases of blackboards, 1,171; cases of mantels, 71; mantels (pieces) 2,704; cases of hearths, 6; cases of flagging, 173½; flagging (pieces) 16,643; cases of sawed slate, 15; cases of pencil slate, 3; making a total by weight of about 29,920 tons for the year.

South Carolina.—Clay slates are stated‡ to occur in this State in a broad band extending along the edge of the Tertiary formations from Edgefield County, on the southwest, to Chesterfield, on the northeast. The present writer has seen none of this material nor has he any knowledge regarding its adaptability for any form of architectural work.

Texas.—Bluish-black slates of a jointed and thinly stratified structure, resembling the surface slates of New Hampshire and Vermont, and promising of great utility, are stated to occur in Llano and Presidio Counties.§ The writer has seen none of these.

Vermont—The roofing slates of Vermont are stated by Professor Hitchcock‖ to exist in three distinct and nearly parallel belts, occupying the eastern, middle, and western portions of the State. The eastern belt extends from Guilford, one of the most southern towns in the State, to Waterford, and probably as far north as Burke, in Caledonia County, where it is cut off by an immense outcrop of granite. The slate of this belt differs from that of the other divisions in presenting a more laminated appearance, resembling closely a mica schist, the cleavage corresponding closely with the lamination, which varies, if at all, but a trifle from the planes of stratification. The stone is represented as of good color, tough, and durable. Besides for roofing purposes it was used largely for tombstones prior to 1830, when marble began to be used in its place. The first quarry opened in this belt is stated by the above authority to have been that of the New England Slate Company, who commenced operations in 1812. At the present time, so far as the author is aware, no quarries whatever are worked in this belt.

The middle range of slate extends from Lake Memphremagog in a

* Rep. D 3, Second Geol. Surv. of Pennsylvania, Vol. I, 1883. pp. 83–160.

† From Rep. D³, 2d Geol. Surv. Pennsylvania, p. 144–146.

‡ South Carolina, Resources, Population, etc., 1883, p. 133.

§ Second Ann. Rep. Geol. of Texas, 1876, p. 26.

‖ Geol. of Vermont, Vol. II, 1861, p. 791.

southerly course as far as Barnard. The slate found in this differs from that of the eastern belt in that it splits more readily into thin sheets, is not so distinctly laminated, and is more uniform in color, "being nearly black and apparently free from the traces of iron oxides." A single quarry is now in operation in this belt, that of the Adams Slate Company, in Northfield, Washington County.

The western and most important of the slate belts of this State extends from a point near the town of Cornwall, on the north, southward through Castleton, Fairhaven, Poultney, Wells, and Pawlet, and passes into the State of New York at Granville. In this slate it is stated "there is a marked difference between the stratification and cleavage planes, the dip of the latter being greater than the former." In color the slates of this region are said to closely resemble those of Wales, being of a dark purple, with blotches of green, while some of the strata are green throughout. In some portions of the formation a red slate occurs, similar to that found across the line in New York State. This variety is not, however, now quarried. This western area furnishes the most fissile and valuable slates of the State, and, as will be seen by reference to the tables, is very extensively worked. The slate is soft and uniform in texture, and can be readily planed or sawn with a steel circular saw, such as is used in sawing lumber. It is well adapted and extensively used, not only for roofing purposes, but for school slates, slate-pencils, blackboards, table-tops, mantels, etc. It is very extensively marbleized. It is stated by Professor Hitchcock* that the first quarry opened in this region was that of Hon. Alanson Allan, who began the manufacture of school slates at Fairhaven in 1845.

Virginia.—On Hunt Creek, a tributary of Slate River, in Buckingham County, in this State, there occur extensive deposits of blue-black slate of a quality suitable for a variety of uses, although they are now used almost altogether for roofing purposes. The principal quarries now worked are at or near the towns of Buckingham, New Canton, and Ore Banks. Another belt of slate of the same geological age (Archæan) as that just mentioned is stated to occur near the southeast base of the Blue Ridge, in Amherst and Bates Counties. Very few samples of any of these have as yet come into the Museum collection.

(*d*) Catlinite, or Indian Pipe Stone.

Although frequently found in the collections of amateur mineralogists, this substance can not be considered a true mineral, but is rather an indurated clay.† It therefore varies greatly in composition, as it does also in color and degree of induration. The usual color is a deep though dull red, often beautifully flecked with small yellowish dots. This form is soft enough to be readily cut with a knife, but is sufficiently firm and compact to retain the sharpest edges and lines that may be

* *Op. cit.*, p. 796.

† See Analyses, Geol. Minnesota, Vol. I, p. 542.

carved upon it. The material first derived its notoriety from the fact that the Sioux Indians utilized it for the manufacture of their pipes and various other articles, and at the present time these same people living in the vicinity of Flandreau, Dak., derive a considerable income from the manufacture and sale of these articles.

Owing to the fact that the material occurs only in a thin bed underlying the hard and tough red quartzite of the vicinity, it can, with the present facilities for extraction, be obtained in blocks of only very moderate dimensions. Its color is such, however, that in proper combinations it could be used very advantageously in interior decorations. The principal source of the material is near Pipe Stone City, in Pipe Stone County, Minn.*

* See Geol. of Minnesota, Vol. I; also Am. Jour. Sci., 1867, p. 15, and Am. Naturalist, 1868–'69.

PART III.

STONES OF OTHER COUNTRIES.

A.—ALABASTER.

Italy.—Alabaster of the finest quality occurs in several parts of Italy, particularly at Miemo, in Tuscany, Fontibagni, and Castellina, and at Aosta, in Piedmont. The purest and best variety is, however, from Val di Marmolago, near Castellina.* Some of these are very extensively worked, the clouded varieties being made into vases and other objects, while the pure white varieties are made into statuettes. In this form they are sold in considerable quantities in this country, passing under the name of *Florentine marbles.* As prepared for the market these are indistinguishable from true marble by any but an expert, and it is safe to say a large number of people are yearly imposed upon. Should one have reason to suppose that this article is being imposed upon him for true marble he has but to try the object in some obscure part with the thumb-nail. Alabaster is readily scratched or indented in this manner while marble is not affected. Another test is to apply a dilute acid. True marble will dissolve and effervesce briskly, while the alabaster remains unchanged. Besides being softer and hence more liable to injury these alabaster objects are inferior to those of marble in that they are more easily soiled and are difficult to cleanse.

It is stated† that the Italian alabaster is, when first quarried, semi-transparent, and that it is wrought while in this state. It is then rendered white and opaque (like marble) by placing the objects in a vessel of cold water which is then slowly raised to the boiling point. It is then allowed to cool to a temperature of about 70° or 80° Fahr. when the objects are removed and carefully wiped dry. At first they appear little changed by their baptism, but gradually assume the desired color and opacity.

B.—SERPENTINOUS ROCKS. VERDANTIQUE MARBLES.

England.—None of the American serpentinous rocks now known can compare in point of beauty, in variety and elegance of colors, with those of the Lizard district in Cornwall, England. A series of polished blocks

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*Hull: Build. and Ornam. Stones, p. 165.

†Appleton's Dict. of Mechanics, Vol. II, p. 387.

of these in the Museum collection show the prevailing colors to be dark olive green with veins, streaks, and blotches of greenish white, chocolate brown, and blood red. The green varieties are often spotted by ill-defined flakes of a "silky bronzitic mineral."

The rock is softer than the serpentine of Harford County, Md., but takes an equally good surface and polish, and works much more readily. It is stated by Hull* to be obtainable in blocks from 7 to 8 feet in length and from 2 to 3 feet in diameter. According to this same authority, the stone is admirably adapted for interior decorations and is now being used for ornamental fonts, pulpits, small shafts, and pilasters, as well as for vases, tazza, and inlaid work.

Considering the remarkable beauty and the variety of colors displayed by this stone, it seems strange that it should not have found its way more extensively into American markets.

The rock is regarded by Bonney† as an altered intruded igneous rock, rich in olivine (Lherzolite).

Italy.—The principal serpentinous rocks of Italy are the ophicalcites of Pegli and Pietra Lavezzara, near Genoa, and of Levante, and the true serpentine of Tuscany. The Verde di Pegli is a breccia consisting of deep green fragments of serpentine cemented by light green calcite. The contrast of colors thus produced is said to be very pleasing. The Verde di Genova stone from quarries at Pietra Lavezzara is also a breccia consisting of green, blackish green, brown, or red serpentine fragments with an abundant cement of white or greenish calcite. It has been quarried from time immemorable and is largely used in France where it is known as *Vert de Gênes.* Its selling price at Turin is about 20 cents per cubic foot. The ophicalcite of Levante is a breccia like the preceding, the fragment being of a violet or wine red color. It is difficult to work but acquires a good polish. The Italian name for the stone is *rosso* or *Verde di Levante;* though sometimes called *granito di Levante.* The Tuscany serpentine from quarries near Prato is known commercially as *Verde di Prato.* The stone is of a deep green color, carrying crystals or nodules of diallage and is traversed by a net-work of fine lines giving it a brecciated appearance. It contains also veins of noble serpentine of a clear, greenish or whitish color. It is softer than ordinary serpentine and acquires only a dull polish, but works very readily. The dark green varieties are most valued, and having been used in ancient monuments is frequently called the *Nero antico di Prato.*‡ This stone is stated by Hull to be subject to rapid decay when exposed to atmospheric influences.

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* Building and Ornamental Stones. p. 102.

† Quar. Jour. Geological Society of London, Vol. XXXIII, Part 2, 1877, p. 584.

‡ Delesse, pp. 77-79.

C.—LIMESTONES AND MARBLES.

(1) AFRICA.

Numidian Marbles.—Within a very few years there have been reopened in Algeria and Tunis the famous quarries of "Numidian" marbles, from whence the ancient Romans are stated to have obtained the celebrated "Giallo Antico" and other stones for the decoration of their houses and temples.

According to Playfair,* the name *Numidian* is incorrect, as the marbles are not found in Numidia proper, but in the provinces of Africa and Mauritania. "Most of the Giallo Antico," says this authority, "used in Rome was obtained from Simittu Colonia, the modern Chemtou, in the valley of Medjerda, the quarries of which are now being worked by a Belgian company; but the most remarkable and valuable marbles are found near Kleker, in the province of Oran, in Algeria. There, on the top of *Montagne Grise*, exists an elevated plateau, 1,500 acres in extent, forming an uninterrupted mass of the most splendid marbles and breccias which the world contains. Their variety is as extraordinary as their beauty. There is creamy-white, like ivory; rose color, like coral; Giallo Antico. Some are variegated as a peacock's plumage, and on the west side of the mountain, where there has been a great earth movement, the rock has been broken up and recemented together, forming a variety of breccia of the most extraordinary richness and beauty."

There are in the Museum collections a series of these,† which range in color through many shades of gray, drab, siena, yellow, and rose-red, and which are designated in our markets under the names of *jaune, antique doré, paonazzo rosso, jaune chiaro ondate, jaune rosé, rose clair, breche sanguin*, and *jaspe rouge.* All are extremely compact and hard and acquire a surface and polish of wonderful beauty. The United States, at present, produces nothing that can compare with them for interior decorations.

Egyptian onyx or "Oriental alabaster."—This beautiful stone, which, like the onyx marbles of Mexico, is a travertine, occurs, according to Hull,‡ in extensive beds amongst the Tertiary limestones of Blad Recam (marble country) near the ravine of Oned Abdallah, Egypt. The

* Geol. Mag., Dec., 1885, p. 562.

† The gift of Mr. E. Fritsch, of New York, by whom they were imported.

‡ Building and Ornamental Stones, p. 179. There is confusion here among authorities. Hull, as above noted, sets down the Egyptian onyx as from Blad Recam. Delesse (*op. cit.*, p. 155), on the other hand, states that the Egyptian rock comes from Beni-Souef, about 25 leagues south of Cairo on the Nile, and from Syout, still farther south, while the Algerian stone is stated to occur at Ain-Tembalek, near the river Isser, in the province of Oran. As the imported stone is known altogether as *Egyptian* onyx, it seems probable that it comes from either Beni-Souef or Syout. To judge from samples in the Museum collections the Egyptian stone is much superior to that of Algeria.

stone was used by the inhabitants of Rome and Carthage for the interior decorations of their houses, but for over one thousand years the quarries were entirely lost sight of, and it was not until 1849 that they were rediscovered by a French gentleman, M. Delmonte. The stone is of a whitish, yellow, and amber color, and presents the peculiar banded and wavy structure common to stones of this class. It is now shipped in considerable quantities to Paris, where it is utilized in the manufacture of candlesticks, timepieces, and similar articles. It is also imported into this country and is used in the decorative work of soda fountains and for small articles of household furniture.

Nummulitic limestone.—The celebrated nummulitic limestone of Eocene age from Northern Africa, and which was so extensively used by the Egyptians in the construction of their pyramids, is represented in the collections of the National Museum by a 7-inch cube, the gift of Commander Gorringe, U. S. Navy. This particular block was formerly a portion of the steps leading to the obelisk at Alexandria, and was brought away at the same time as the obelisk itself. Hull states that this stone was used in the construction of Baalbec, Aleppo, and some of the cities of the Holy Land. The pyramid of Cheops is of the same material.*

(2) BELGIUM.

This country is stated by Violet† to be exceptionally rich in colored marbles, though white varieties are entirely wanting. They are mostly of a somber or dull color, and, like the marbles of Northern France, belong, according to Delesse,‡ to the Carboniferous and Devonian formations. The principal varieties now quarried for exportation, as represented in the collections of the National Museum, are the black of St. Anne, from Busnie, province of Namur, the blue from Couillet, near Charleroi province of Hainaut, the reds from Cerfontaine and Merlemont, near Philippeville, province of Namur, and the well-known "Belgian black" from quarries in Golzines, and the environs of Dinant, also in the province of Namur.§ All of these are very fine grained and compact, admitting of smooth surfaces and high polish.

The St. Anne marble is of a deep blue-black color with many short and interrupted veins of white; those of Couillet are much lighter in color and with more white; some of the varieties are breccias composed of fragments of compact blue-gray limestone imbedded in a white crystalline matrix. The red marbles of Cerfontaine and Merlemont are known as *rouge griotte*, *rouge griotte fleuré*, *rouge impérial*, and *rouge royal*.

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* *Op. cit.*, p. 236.

† Les marbres, p. 44.

‡ Matériaux de construction, p. 194.

§ Violet gives the full list of Belgian marbles as follows: "Le marbre Saint Anne, le rouge royal, le rouge impérial, la griotte de Flandre, la griotte fleurie, le granite belge, le bleu belge, le Florence belge, bizantin belge, bleu antique, le grand antique, le petit antique, et les marbres noirs de Golzinnes et de Dinant."

All are dull red, of light and dark shades, variously spotted, flecked, and veined with white and gray; none of them are as brilliant in color as the French *griottes*. The variety *rouge royal* is very light, and somewhat resembles certain varieties of the Tennessee marbles, but is inferior. The well-known "Belgian black" is of a deep black color, hard and difficut to work, but takes a high polish, and is considered the best of its kind now in the market.

(3) BERMUDA.

The building stones of Bermuda are altogether calcareous and fragmental. Although popularly known as coral limestones, they contain as a rule fully as large a pro portion of shell as of coral fragments. Nearly all the quarried material belongs, according to Professor Rice,* to the drift sand-rock variety, *i. e.*, rocks made up of fragments blown inland from the beach and subsequently cemented by calcareous matter in a crystalline or subcrystalline state. The rock varies in color and texture from chalky white, fine grained, and porous (somewhat like the French Caen stone), to a darker, coarser, but tough and compact form, in which the individual fragments, often of a pink color, are one-fourth of an inch or more in diameter.

According to the authority above quoted the rock is usually very soft and is quarried out in large blocks by means of a peculiar long-handled chisel, and afterward sawn up in sizes and shapes to suit individual cases. The harder varieties, as found at Paynter's Vale and elsewhere are, however, worked like "any ancient limestone or marble."

Most of the houses of Bermuda are stated by Professor Rice to be built of this soft, friable var iety, and even the roofs are covered with the same material sawn into thin slabs. When covered with a coating of whitewash the stone is found sufficiently durable for ordinary buildings in that climate, but if exposed to the rigors of a New England winter it would crumble rapidly. The hard rock, such as is found at Paynter's Vale and Ireland Island, "has been used in the construction of the fortifications and other Government works" on the islands. "The quarry of the Royal Engineers, near Elbow Bay, appears to be in beach-rock."

(4) ENGLAND.

Bath oolite.—The well-known Bath stone or Bath oolite is a light, almost white or cream-colored oolitic limestone from quarries in the Jurassic formations which extend from the coast of Dorset, in the south of England, in a northeasterly direction through Somersetshire, Gloucestershire, Oxfordshire, Northamptonshire, to Lincolnshire, to Yorkshire.†

In texture it is distinctly oolitic, soft, and very easy to work. Its

* Geol. of Bermuda, Bull. 25, U. S. Nat. Mus., 1884.

† Hull, Building and Ornamental Stones, p. 210.

durability when exposed in the trying climate of America is a matter of great doubt.

Nevertheless, churches and cathedrals erected in the west of England as long ago as the eleventh, twelfth, and fifteenth centuries, are stated by Hull* to be still in good preservation.

As yet the stone has been but little used in this country, though a movement has been of late on foot for its introduction.

Portland stone.—This stone, which has been in use in England since the middle of the seventeenth century, is a light-colored Jurassic limestone from quarries on the Isle of Portland, near Weymouth. In composition it is a nearly pure carbonate of lime, but its texture is too uneven to recommend it for other than massive structures. It was used in the construction of St. Paul's Cathedral (London), and many churches erected during the reign of Queen Anne. †

(5) FRANCE.

Griotte, or French Red.—This beautiful stone takes its name, according to Violet,‡ from the griotte cherry, owing to its brilliant red color. When, as frequently happens, the uniform redness is broken by small white spots, it is called "birds-eye griotte" (*griotte œil de perdrix*). Some varieties are traversed by white veins, but these are regarded as defects and are avoided in quarrying. The stone is found in several localities in the French Pyrenees, notably in the valley of the Barousse, of the Pique, at the bridge of the Taoulo, and in the environs of Prades. It is used for all manner of interior decorative work in France, and is exported to a very considerable extent to this country. This is by all odds the most brilliant in color of any marble of which the author has knowledge. In the small slabs usually seen in soda-fountains, counters, etc., it appears homogeneous and free from flaws. As displayed in the halls of the capital building at Albany, N. Y., however, it is full of flaws and has been so extensively "filled" as to give the whole surface a gummy appearance, in striking contrast with that of the Tennessee marble with which it is associated. The price in France as given by Violet § is from 400 to 500 francs per cubic meter, or about $2.75 to $3.50 per cubic foot, according to quality.

Another marble of a brilliant scarlet color, blotched with white and known as Languedoc marble or French red, is stated by Violet (*op. cit.*) to occur at various points in the Pyrenees, but in masses of exceptional beauty and compactness at *Montagne Noire* (Black Mountain), where it has been quarried since the sixteenth century. It is obtainable here in blocks of considerable size which bring in the market of Carcassone prices varying from 250 to 350 francs per cubic meter, or, roughly speaking,

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Op. cit., p. 209.

† Hull, p. 212.

‡ Les Marbres, etc. Rapports sur L'Exposition Min., 1878, xxviii, p. 15.

§ *Op. cit.*, p. 16.

from $1.75 to $2.50 per cubic foot. Other French marbles, though which are but little used in this country, are the rose marble from Caunes, the *vert-moulin*, also called *griotte campan*, the *campan vert*, or the *campan mélangé*. The wrongly so-called Italian griotte is, according to Chateau,* obtained from quarries at La Motte de Félines-d'Hautpoul, department of Herault. Violet states that this name was given it simply that it might command a higher price.

Caen stone.—This is one of the most noted limestones of modern history. It is a soft, fine-grained stone, very light colored, and admirably adapted for carved work, but so absorbent as to be entirely unfitted for outdoor work in such a climate as that of the United States. Egleston † states that in the climate of New York City the stone does not endure longer than ten years unless protected by paint.

The stone takes its name from Caen, in Normandy, where the principal quarries are situated. It was probably introduced into Great Britain soon after the Norman conquest, where it was largely used in cathedrals and other buildings down to the middle of the fifteenth century. The cathedral of Canterbury and Westminster Abbey are of this stone.‡

Brocatelle.—This is a very beautiful marble and much used for mantels and other interior decorations. The body of the stone is very fine and compact, and of a light yellow color, traversed by irregular veins and blotches of dull red. It is further variegated by patches or nodules of white crystalline calcite. It takes an excellent polish and requires less filling than many marbles. Its source is stated by Violet § to be Jura, in southern France. The stone is difficult of extraction and brings a high price.

The name brocatelle is stated by Newberry ‖ to signify a coarse kind of brocade used for tapestry.

(6) GERMANY AND AUSTRIA.

The two principal marbles now imported from this country are known commercially as *Formosa* and *Bougard*. Both are very beautiful stones, ranking among the finest now in general use. The first named is dark gray and white mottled and blotched with red; it is slightly fossiliferous. The Bougard has about the same colors, but is lighter and the tints are more obscure.

Lumachelle marble—This is a fossiliferous limestone in which the shells still retain their nacre, or pearly lining, and which when polished gives off in spots a brilliant iridescent luster with rainbow tints; the finer varieties being seemingly set with opals. It is a beautiful stone for

* *Op. cit.*, p. 443.
† Cause and prevention of the decay of building stone, p. 27.
‡ Hull, p. 230.
§ *Op. cit.*, p. 33.
‖ Rep. of Judges, p. 148.

inlaid work and elaborate ornamentation, but is usually found only in small slabs. A variety quite commonly seen in mineral cabinets is of a dark grayish-brown color and with occasional brilliantly iridescent spots and streaks like those of the fine opal. It is brought from Bleiberg and Hall in the Tyrol in Austria.

(7) ITALY.

The quarries of the Apennines in northern Italy, near Carrara, Massa, and Serravezza, furnish marbles of a great variety of colors of the finest qualities and in apparently inexhaustible quantities. To give a full description of these quarries and their various products would be to transcend the limits of this work. I shall therefore confine myself to a brief description of only those stones which are imported to any extent into this country.

White statuary marble.—This is a fine-grained saccharoidal pure white stone, without specks or flaws. On a polished surface it has a peculiar soft, almost waxy, appearance, entirely different from the dead whiteness of the Vermont statuary marbles, to which it is considered greatly superior. It is brought principally from the Poggio Silvestro and Betogli quarries, that from the first-named locality being considered the best. The price of the stone in Italy varies from 15 to 40 lires per cubic foot in blocks of sufficient size for an ordinary statue 5 feet in height.

Ordinary white or block marble.—This is usually white in color, though sometimes faintly bluish and veined. It is largely imported into this country, and used for monumental work. The variety from the Canal Bianco quarries is white, with faint bluish lines; that from Gioja quarries is fine-grained, and uniformly white and somewhat translucent, sometimes resembling gypsum on a polished surface. The variety from the Ravaccione quarries is faintly water-blue, while that from the Tautiscritti quarries is of similar color, but traversed by fine, dark-bluish veins. These stones sell for from 4 to 10 lires per cubic foot in blocks containing 20 cubic feet each.

The veined marbles from the Vara and Gioja quarries are of a white color, but often blotched with darker hues, and traversed by a coarse irregular net-work of faintly bluish lines. The Bardiglio marbles of the ordinary type from the Para and Gioja quarries are of a water-blue color, blotched irregularly with white, and far inferior in point of beauty to the justly-famed *Bardiglio veined* marbles from the Seravezza quarries. These are of a light-blue color, traversed by an irregular net-work of fine dark-blue lines, intersecting one another at acute angles. This stone is used very extensively in soda-water fountains, counters, and for panellings.

The *Red Mixed* marble from quarries at Levante is also much sought, but works with difficulty and requires much filling. It is properly a breccia, composed of irregular whitish and red fragments embedded in

a reddish paste. It does not take a high polish, nor are its colors brilliant. The so-called *Parmazo* marbles, from the Miseglia, Pescina, and Bacca del Frobbi quarries, are all white or whitish, and traversed by a very coarse net-work of black or blue-black veins.

The Yellow or Siena marbles are, next to the white statuary, probably the most sought and widely-known of Italian marbles. Like the majority of foreign colored marbles, they are exceedingly fine-grained and compact in texture, and take a high lustrous polish. The prevailing color is bright yellow, though often blotched with slight purplish or violet shades. When these darker veins or blotches prevail to a considerable extent the stone is called *Brocatelle.* The most beautiful variety of the Siena marble is obtained, according to Delesse, from Monte Arenti, in Montagnola. It is of a uniform yellow color, but blocks of large size can be obtained only rarely, and these often bring a price as high as $6 per cubic foot. The Brocatelle variety from the same locality is worth only about two-thirds this sum.

The Portor or Black and Gold marble.—This is, according to Delesse, a black silicious limestone, traversed by yellowish, reddish, or brown veins of carbonate of iron. It is brought chiefly from the Isle of Palmaria, in the Gulf of Spezia, and from Porto Venere. A small amount is also produced at Carrara and Serravezza. Blocks of this stone in the National Museum show a good surface and high polish. It is a beautiful stone, and the name black and gold well describes it. The Portor marble, from the Monte d'Arma quarries, is a breccia of fragments of black limestone with a yellowish cement. This is inclined to break away in the process of dressing, thus rendering the production of a perfect surface impossible without much filling.

Black marble.—A fair variety of this material is brought from the Colonnata quarries. The stone is not so dark as the Belgian black, nor does it admit of so high a polish.

Breccia marble.—The breccia marbles from Gragnana and Serravezza I have never seen in use in this country, though they are stated to be imported to a slight extent. The first-named consists of small bluish-white fragments cemented closely by a chalk-red cement, while the second variety has both white and red fragments similarly cemented.

The Yellow marbles of Verona and Graguana are entirely different in appearance from those of Siena, being rather of a brownish hue, and taking only a dull polish. They are compact rocks, excellently adapted for decorative work. The so-called red marble from the Castel Poggio quarries is rather a chocolate color, dull in polish, but pleasing to the eye.

Ruin marble.—This is a very compact yellowish or drab limestone, the beds of which appear to have been fractured in every conceivable direction by geological agencies, after which the resultant fragments have become recemented by a calcareous or ferrugenous cement. The rock is therefore really a breccia, although the proportional amount of

cement is very small, and the actual displacement of the various particles but slight. When cut and polished the slabs have somewhat the appearance of mosaics, representing the ruins of ancient castles or other structures. Hence the name of "ruin marble." The locality as given by Delesse, is in the environs of Florence, Italy, at the bridge of Rignaud, valley of the Siene.

(8) JAPAN.

Stone is but little used as yet in Japan for purposes of construction. Granite, trachyte, and trachyte-tuff are said to be used for foundations, temple stairs, gate-ways, sea-walls, and battlements, but the superstructures are nearly always of wood, this material being preferred on account of its cheapness.* A variety of marbles and other stones, suitable for decorative purposes, are found in Mino and Hitachi provinces, and quite a complete series of these have been received at the National Museum. Those from Mino are white, reddish, blue-gray, and nearly black, with white fossils. They are often beautifully brecciated. One of the finest varieties from Hitachi province has a nearly white groundmass, traversed by a net-work of fine bluish lines like the Italian bardiglio. Other colors are pure white, white with greenish veins and blotches, caused by a talcose mineral. There is also quite a series of dark greenish, sometimes nearly black, rocks, variously spotted with elongated crystals of black amphibole, and which are evidently steatite or agalmatolite. They are catalogued merely as marbles, and as yet no opportunity has arisen for an accurate determination of their mineral composition.

(9) MEXICO.

Mexican onyx.—This beautiful stone, which, however, is not a true onyx, but a travertine, occurs, according to M. Barcena,† in extensive deposits in several localities in Mexico, but that at present most worked is located in the neighborhood of Tecali, State of Puebla. As here found, the rock is interstratified with "argillaceous calcareous rocks," marls, and sands. It is of a fine even grain, close surface, and permits of a very high polish. Its colors are varied; green, red, amber, yellow, through all shades to white, beautifully veined and mottled, are common. It is translucent, and the colorless varieties quite transparent in slices not over one-fourth inch in thickness. I am informed by Signor Aguilera, of the Mexican Geological Commission that slabs 2 feet in diameter and one-fourth inch in thickness have been used as window-panes in the building of the University of Mexico, and with beautiful effect. The same gentleman also informs me that the ordinary varieties of the stone are so common and little esteemed in the vicinity of the quarries, that the rough blocks are utilized by the natives in build-

* Official Catalogue, Japanese Section, Internat. Ex., Philadelphia, 1876.

† Proc. Acad. Nat. Sciences, 1876.

ing the walls of their houses. It was from this fact that the locality derived its name, "Tecali," meaning in the Mexican tongue a stone house, being from the two words *tetl* (stone) and *calli* (house).

The collection of these marbles in the National Museum shows them to be the most beautiful of their kind known, excelling even the celebrated "Oriental alabaster" from Algeria and Egypt. At present it is quarried only in an itinerant way, by the natives, who show wonderful skill in shaping it into small ornaments, which they sell to tourists. Rough blocks of small size are shipped to New York, where they are sawn into tops for light furniture, and which bring very high prices. With the opening up of railroads in Mexico we may expect systematic quarrying to be commenced, and that the price of the cut stone will be so reduced as to permit of its coming into more general use.*

The composition of the lighter variety of the stone as given by Barcena is as follows:

	Per cent.
Lime	55.00
Magnesia	1.25
Water, oxide of iron, and manganese	0.10
Carbonic acid	42.40
Sulphuric acid	1.25

(10) SPAIN AND PORTUGAL.

This country possesses a great amount and variety of stone suitable for building and ornamental work, but, so far as we are aware, only a few of the marbles and limestones are exported to this country and need be referred to here.

There is stated to be a zone of crystalline marbles of white, yellow, and flesh color, which extends through the provinces of Estremoz, Borba, and Villa Viçosa; a black variety with white veins also occurs at Monte Claros. These are all susceptible of a good polish, and blocks of large size can be obtained. The beds belong to the Laurentian formations. In Vianna, Alrito, Portel, and the mountains of Ficalho other marbles are found of the same general character. The rocks of the Jurassic and Cretaceous formations also furnish a large quantity of material for building and ornamental use. This is especially the case at Coimbra, Figueira da Foz, Cintra, and Pero Pinheiro. At Cintra the limestones have been metamorphosed by the adjoining granites, while those of Pero Pinheiro were likewise metamorphosed by the volcanic rocks of the suburbs of Lisbon.†

One of the finest of the above-mentioned marbles, and one which is much used in the United States, is the yellow, from Estremoz. This is known commercially as *Lisbon* marble. In color and texture it is almost identical with the celebrated Italian Siena, with which it favorably

* Two beautiful large slabs of this stone may be seen among the Grant relics in the National Museum.

† Port., Spec. Cat. Dept. I, II, III, IV, and V; International Exhibit, 1876, p. 29–30.

compares. A peculiar stone from this same locality is white with streaks and blotches of a blood-red color. It is more peculiar than beautiful. The marbles of Pero Pinheiro are of mottled white and pink—almost red—color, fine grained and compact. They are said to have been extensively used in Lisbon, where they have proved very durable. Other marbles that perhaps need especial mention are the breccias from Serra da Arrabida and Chodes, Saragossa Province. The first named is composed of rounded and angular pebbles of a gray, drab, black, and red color, embedded in a dull red paste. In a general way it resembles the breccia from Montgomery County, Md., but has less beauty. The Chodes stone is composed of very angular fragments, of a black color, in a reddish-brown paste. The proportion of paste to the fragments is very large and much filling is necessary in polishing. Fine, compact marbles of dull reddish hues, often veined with drab, occur in Pannella province. Others that may be mentioned are the red and yellow mottled marbles of Murcia province, the black of Alicante province, and the black white-veined breccias of Madrid. A fine translucent alabaster is also included in the collections from Saragossa province.

A very full series of these stones was exhibited at the Centennial Exposition at Philadelphia in 1876, and from there was transferred to the National Museum.

D.—GRANITIC ROCKS.

(1) EGYPT.

Granite of Syene.—The now well-known red granite, formerly called syenite, from near Syene, Egypt, and from which was constructed the numerous obelisks of the Egyptians, is represented in the Museum collections by a block some 10 inches long by 5 inches broad, and which was presented by the late Commander H. H. Gorringe. The block was at one time a portion of one of these obelisks, as it was found during the excavations preparatory to the removal of the obelisk now in Central Park, New York, from Alexandria. The rock, which is very coarse, is of a general reddish color and is composed of large crystals of red and whitish feldspars intermixed with clear, glassy quartz and coal-black mica and hornblende. Some of the red feldspars are very large, exceeding an inch in length. The original source of the granite is stated to have been Upper Egypt, where it occupies large tracts between the first cataract of the Nile and the town of Assouan, the ancient Syene. It was quarried by the Egyptians as far back as one thousand three hundred years before the Christian era and has been fashioned into obelisks, sarcophagi, and colossal statues innumerable.* The block in

* See Hull, *op. cit.*, p. 51; also Gorringe's "The Egyptian Obelisk," N. Y., 1882, or Jour. Geol. Soc. of London, Vol. VII, 1850–'51, p. 9.

the Museum collections still shows the ancient carving supposed to have been made upon it upwards of three thousand years ago.

A fragment of a blue-gray hornblendic granite was also received from Alexandria with that described above. Its original source is not known.

(2) BRITISH PROVINCES OF NORTH AMERICA.

New Brunswick.—In the vicinity of St. George, Kings County, occurs an inexhaustible supply of a red hornblendic intrusive granite, which is beginning to be extensively worked, and which has been introduced into the markets of the United States, where it is known as "Bay of Fundy granite." In texture the rock is medium coarse, very like that of Calais and Jonesborough, Me., from which, however, it differs in depth of color and in bearing hornblende in place of mica. It is tough and compact, takes a brilliant polish, and is apparently durable. An urn of this material in the National Museum is one of the most beautiful granite objects in the entire collection. The quarries now worked are situated about 2½ miles from the town of St. George, where the rock occurs in rugged hills, and of varying shades of color from deep red to cream color or gray, the latter colors occurring in occasional large patches, 20 to 40 feet across, and of indefinite length. The quarries are opened along the hillside, where the rock is very conveniently jointed for getting out large blocks.*

Nova Scotia.—Gray mica-bearing granites of apparently excellent quality, and varying in texture from medium fine and homogeneous to coarsely porphyritic are quarried at Shelburne, and at Purcell's Cove, in Halifax County. These are exported to some extent into the United States. Two 12-inch cubes are in the collection of the National Museum.

(3) SCOTLAND.

The granites brought into this country from Scotland are the coarse red from Peterhead, and the gray from Aberdeen. Both are excellent stones and are used very largely for monumental work, door-posts, and pillars in all our cities and towns. In point of beauty they are inferior to many of our native granites, but their well-established reputation will probably cause their being used for many years to come. The Peterhead granite is stated† to weigh 165.9 pounds per cubic foot, and to be composed of quartz, orthoclase, albite, and black mica. The Aberdeen granite has the same composition, excepting that its triclinic feldspar is oligoclase in place of albite, and there is sometimes present a little white mica. It is of this latter stone that the city of Aberdeen is largely built. A coarse gray granite with large, well-defined porphyritic crystals of pink orthoclase is also imported from Shap, in northern England. None of these stones have any exact counterpart among the granites of this country. Six small turned and polished columns of these are in the National Museum.

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* Rep. of G. F. Mathew, Geol. Surv. of Canada, 1876–'77, pp. 345–349.

† Building Construction, p. 20.

E.—QUARTZ PORPHYRIES.

Russia.—From the Isle of Hoghland, in the Gulf of Finland, the Museum has received a variety of quartz porphyries. These have mostly a dull red, very compact base, and carry large, nearly white, pinkish or reddish feldspars and glassy quartz in great profusion. The rocks acquire a good surface and polish, but are intensely hard. Other porphyritic and compact rocks, variously called diorites, keratites, and porphyries, were received from the district of Katharinenburg, in the Urals, as noted in the accompanying catalogue of the collections.

F.—SANDSTONES.

(1) BRITISH PROVINCES OF NORTH AMERICA.

Ontario.—On Vert Island, Nipigon Bay, in the northern part of Lake Superior, there occurs an extensive deposit of sandstone of Potsdam age, in which quarries have been opened within a few years, and the product of which has already found its way into the principal markets of Canada and the Lake cities of the United States. The stone is of fine and even grain, not distinctly laminated, hard, and of a bright reddish-brown color. It is said to occur in inexhaustible quantities, and that blocks as large as can be handled can be readily obtained.

An 18-inch cube from this locality in the collections of the National Museum shows it to be one of the most attractive appearing of our red sandstones. It cuts to a sharp and firm edge, and every appearance would indicate it to be very durable, though possibly liable to fade slightly on exposure. I am informed that its hardness is such that it can not be sawn with sand in the usual manner, but must be cut either with diamond-toothed circular saws or by means of chilled iron globules.

A thin section of the stone submitted to microscopic examination shows it to consist of closely compacted grains of quartz and feldspar, and an occasional shred of mica interspersed with iron oxides, which serve as a cement and give color to the stone. The feldspars are often kaolinized and there is an occasional grain of calcite.

New Brunswick and Nova Scotia.—Sandstones, varying in color from red to yellow and light gray with an olive-green tint, are very abundant among the Lower Carboniferous rocks of Albert and Westmoreland Counties in the province of New Brunswick. They are, as a rule, soft enough to be readily cut when first quarried, but harden on exposure.* So far as the author is aware the only one of these varieties extensively used in the United States is the olive-green from Dorchester, Hopewell, and neighboring localities near Shepody Bay, at the head of

* Dawson, Acadian Geology, p. 248.

the Bay of Fundy. The stone is of fine and even grain, works readily, and has been used both in carved and plain work with excellent effect in New York and neighboring cities. The author has had no opportunity of investigating personally the weathering properties of the stone. By some it is claimed as very durable, while by others it is regarded as unfit for finely-carved work exposed to the atmosphere. It is probable that sufficient time has not elapsed since its introduction to fully show its qualities, either good or bad. Sandstones of quite similar appearance and of the same geological age are quarried in various parts of Nova Scotia, particularly at Saw Mill Brook, near the head of Pictou Harbor. These are exported to some extent to this country.*

Owing to the fact that the Nova Scotia stone was the earliest introduced into our market, it has become confounded with that of New Brunswick, which it closely resembles, and it is customary to speak of all stone from this region as "Nova Scotia stone." As noted by Julien, however, full 95 per cent. of the imported material is, in reality, from Westmoreland and Albert Counties, New Brunswick.

(2) SCOTLAND.

So far as I am aware, the only Scotch sandstones regularly brought to the United States are the Corsehill stone, from near Annan, in Dumfriesshire; the Ballochmile stone, from Forfarshire, and a third variety from Gatelaw Bridge, about 30 miles from Ballochmile, in Dumfriesshire.

Of these the Corsehill stone is of greatest importance. Samples in the Museum collections are of a fine and even grain, distinctly laminated, and of a bright red color. The stone is stated by the agents to have been first introduced into this country about 1879, since which it has been quite extensively used for trimmings and general building. It is regarded by Julien† as a durable stone and well adapted for ashlar work, for carving, and for columns. The strength and chemical composition of this stone are given in the tables.

The other varieties mentioned are of the same general appearance as the Corsehill stone, and are used for the same purposes.

As these stones are brought chiefly as ballast by vessels sailing from Carlisle, England, they are known commercially as "Carlisle stone," regardless of their true source.‡

There are in the Museum collections samples of other Scotch sandstones from quarries in Morayshire, Nairn, Caithness, Sutherland, and Ross. These are all of a light color and seemingly possess no qualities to warrant their use in preference to materials obtainable nearer home.

*Dawson, Acadian Geology, p. 345.
†Rep. Tenth Census, Vol. X, p. 318.
‡Julien, *loc. cit.*

G.—SLATES.

(1) CANADA.

Slates of excellent quality, smooth, homogeneous, and strong, and of green, red, purple, and blue-black colors, occur in Richmond County, in the province of Quebec. These are now being quarried and are to be found in the principal markets of the United States. The leading quarries as given by Newberry * are those of the New Rockland Slate Company, the Melbourne Slate Company, the Rankin Hill Slate Company, and the Danville School Slate Company.† Of these the writer has seen and examined only material from the New Rockland quarries, a large slab of which is in the National Museum. It is apparently of excellent quality.

(2) GREAT BRITAIN.

The finest roofing slates of Great Britain are stated by Hull‡ to be derived from the Cambrian and Lower Silurian formations of North Wales. The Cambrian slates are stated to be generally of a green and purple color, while those of the Silurian formations vary from pale gray to nearly black. The stone splits with wonderful facility into very thin sheets, and the quarries are especially favorably situated both for working and for shipment. Material from these sources has been sent to every quarter of the globe, and has been more extensively used for roofing than any other slate now quarried.§

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* Report of Judges, p. 164.

† Further details regarding the slate areas of Canada are given in Geology of Canada, 1863, pp. 830, 831.

‡ *Op. cit.*, p. 292.

§ For a detailed account of the Welsh slates and the methods of quarrying see Davies Slate and Slate Quarrying, Crosby, Lockwood & Co., London.

PART IV.

APPENDIX A.

THE QUALITIES OF BUILDING STONE AS SHOWN BY THEIR CRUSHING STRENGTH, WEIGHT, RATIO OF ABSORPTION, AND CHEMICAL COMPOSITION.

(1) GENERAL REMARKS.

The present methods of testing building stone are at best extremely unsatisfactory and the results obtained unreliable. In the majority of cases, indeed, no attempt is made to ascertain the resistance of the material to the action of fire, frost, or the general effects of weathering. This is due in part (1) to a lack of knowledge of methods by which such tests can be made, (2) to a lack of appreciation of the necessity of such tests, (3) to a desire on the part of quarriers to get the stone immediately upon the market without the delay necessitated by a long series of experiments, (4) to the expenses attendant upon such experiments, and (5) in altogether too many cases to a desire on the part of interested parties to sell the stone regardless of its qualities. Even the tests that are now applied are in many cases practically valueless, owing to a lack of definiteness in stating results, or our inability with our present knowledge to interpret them properly. Take for instance the chemical analysis of a sandstone as ordinarily given. This shows the presence of certain percentages of iron oxides, alumina, lime, and silica, but we have no means of knowing in just what conditions these substances exist; whether the iron occurs as a hydrous or anhydrous oxide, is confined wholly to the cementing material, or is a constituent of the various minerals composing the stone itself. The same may be said regarding at least a part of the silica, alumina, and lime. These difficulties may be in part avoided if the analysis is supplemented by a microscopic examination, whereby is ascertained the mineralogical nature of the stone, its structure, and the freedom from decomposition of its constituent parts. And indeed as a rule it may be said that while the analysis of any stone is of interest in a general way, it fails completely to give more than an approximate idea of its value for constructive purposes. Any analysis should always be preceded by a microscopic examination, and if the results of such examination should show it to be essential this should be followed by a pulverization and me-

chanical separation of the mineral constituents, which may in their turn be in part or wholly subjected to analysis.

Strength and ratio of absorption.—The test of compressive strength is at the present time the principal test to which a stone is put to ascercertain its adaptibility to any particular kind of structural application. The value of the results are, it seems to the author, greatly overestimated. It is a rule among builders never to place a stone where it will be subject to more than one-tenth the pressure it has shown itself capable of bearing by actual experiment. Even under these circumstances there is scarcely a stone in the market that would not be found when freshly quarried strong enough for all ordinary purposes of construction. The problem is not what will a selected and carefully prepared sample of the stone bear to-day, but what will it bear after many seasons' exposure to heat and frost? For all ordinary purposes of construction the excess of strength of any stone over 15,000 pounds per square inch is of little value excepting so far as it denotes density, and hence greater resistance to atmospheric influences.

The size of the cubes tested and the methods used in their preparation are matters that need consideration in making comparisons of results in any series of experiments. General Gillmore found* that within certain limits "the compressive resistance of cubes per square inch of surface under pressure increases in the ratio of the cube roots of the sides of the respective cubes, expressed in inches." Thus a series of cubes varying in size from one-fourth inch to 4 inches square were found to give results varying from 4,992 pounds to 11,720 pounds per square inch of surface. It naturally follows that ambitious dealers desiring any stone to show great power of resistance would select the larger sized cubes to be experimented upon. That the method of preparing a cube to be experimented upon is of moment will become apparent when we consider that in the process of dressing a small sample by hammer and chisel it becomes filled to a greater or less extent with small fractures and hence will break under less strain than though carefully sawn out and ground down to a smooth and even surface.†

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*Report on compressive strength, etc., of building stone, Ann. Rep. Chief of Engineers, 1875.

†The author ventures to submit the following scheme for testing stone in addition to the chemical methods already alluded to. It aims to accomplish in the course of a few weeks results such as would be brought about by natural weathering in perhaps as many years.

Let six samples of the stone, all from the same bed and so far as can be determined all exactly alike, be selected and dressed by sawing and grinding (never by hammer and chisel) to a uniform size, say 2-inch cubes. From not less than three of these let the ratio of absorption be ascertained by weighing, immersing in water for not less than twenty-four hours, and reweighing. Take two of the cubes and ascertain their crushing strength when dry; two more and in like manner ascertain their crushing strength when saturated with water, say after twenty-four hours' immersion though a longer time would be preferable. Take the two remaining cubes and,

The specific gravity or density of stone having been considered by many as sufficiently indicative of their strength to be authoritative, the series of tests given below were made by Dr. Böhme. The results obtained seem to show that while with limestones this might be true, with sandstones such tests could not be relied upon. A moment's reflection will be sufficient to show us the cause of this, since the strength of any stone, which is but an aggregate of minerals, is necessarily dependent not upon the hardness, density, or toughness of the individual minerals themselves, but upon the tenacity with which they adhere to one another. (See *ante* p. 306.)

(*a*) *Limestone with a specific gravity of* 2.68.

	Five wet samples.	Five dry samples.
Lowest strength	7,154.16	7,267.95
Highest strength	9,984.54	10,581.91

(*b*) *Limestone with a specific gravity of* 2.70.

	Eleven wet samples.	Eleven dry samples.
Lowest strength	8,050.22	8,050.22
Highest strength	10,738.36	12,515.80

(*c*) *Limestone with a specific gravity of* 2.71.

	Six wet samples.	Six dry samples.
Lowest strength	7,196.83	7,879.54
Highest strength	12,316.72	13,668.60

after careful weighing, saturate them with water, and subject them to freezing and thawing by artificial temperatures; weighing them again, at the conclusion of the experiments, to learn the loss of material, if any. After the freezing tests are concluded the same cubes should, in their saturated condition, be submitted to crushing tests. By a comparison of the results thus arrived at it is believed a better knowledge of the durability of any stone could be obtained than would be possible in any other way than by the actual exposure of the stone for a period of many years. Where stones are to be subjected to the action of the acid gases of cities or liable to be subjected to high temperatures from burning buildings, artificial atmospheric and fire tests can readily be applied after the plan adopted by Professor Winchell (Geol. of Minn., final rep., Vol. 1). The actual cost of such a series of experiments need not necessarily be great after the apparatus has once been established. Had such a series been inaugurated by the National Government years ago, we might have been spared the infliction of the painted walls of the White House and Capitol.

(*d*) *Limestone with a specific gravity of* 2.72.

	Five wet samples.	Five dry samples.
Lowest strength	9,073.27	9,600.50
Highest strength	15,033.71	14,934.15

(*e*) *Sandstone with a specific gravity of* 2.54.

	Wet samples.	Dry samples.
No. 1	12,487.40	13,668.60
No. 2	15,488.80	14,607.02

(*f*) *Sandstone with a specific gravity of* 2.56.

	Wet samples.	Dry samples.
No. 1	10,169.44	9,700.10
No. 2	18,518.24	18,902.37

(*g*) *Sandstone with a specific gravity of* 2.59.

	Wet samples.	Dry samples.
No. 1	8,932.04	9,700.10
No. 2	11,051.27	11,349.56
No. 3	17,224.45	16,754.40

See Am. Arch., November 4, 1882.

(2) MODULUS OF ELASTICITY.

By the term *modulus of elasticity* is understood the amount of force in pounds requisite to stretch a bar of any material 1 inch square to twice its original length, provided the rate of stretch could continue uniform throughout the trial without the breaking of the material. The *modulus of rupture* is the force requisite to break a similar bar 1 inch square resting upon supports 1 inch apart, the load being applied in the middle.

So far as the writer has been able to learn, but few tests of this nature have been made upon stone. The following are from the report of Mr. T. H. Johnson.*

* Rep. State Geol. of Indiana, 1881, p. 45.

It will be noticed that there is a strong discrepancy in favor of sawn over tool-dressed stone.

Kind of stone.	Modulus of rupture.	Modulus of elasticity.	Crushing strength.
Oolite limestones, Indiana, tool dressed*	1,477	2,679,475	7,857
Oolite limestones, Indiana, sawn†	2,338	4,889,480	12,675
Granite, Hallowell, Me., tool dressed‡	1,754½	2,511,800	.....
Sandstones, Ohio, sawn§	479	398,234	.....
Compact limestones, Indiana, sawn‖	2,825	6,300,000	16,312

* Average of twelve determinations.
† Average of four determinations.
‡ Average of two determinations.
§ Average of five determinations.
‖ Average of four determinations.

(3) TABLE SHOWING THE SPECIFIC GRAVITY, STRENGTH PER SQUARE INCH, WEIGHT PER CUBIC FOOT, AND RATIO OF ABSORPTION OF STONES OF VARIOUS KINDS.

Kind of stone.	Locality.	Size of cube.	Position.	Strength per square inch.	Specific gravity.	Weight per cubic foot.	Ratio of absorption.	Remarks.	Authority.
		Inches.		*Pounds.*		*Pounds.*			
Biotite granite (?)	Niantic, Conn	2	Bed	9,550	2.600	162.5	1/50	Burst suddenly; pores supposed filled with red pigment.	Gillmore.
Do	do	2	Bed	9,450	2.580	161.2	1/50	Burst suddenly	Do.
Gneiss	Sachemshead, Conn	2	Edge	15,937	2.620	163.7	1/50	do	Do.
			Bed	14,000					
Hornblende biotite gneiss.	Greenwich, Conn	2		11,500	2.835	177.2		Average of two determinations; broke suddenly without cracking.	Do.
Biotite granite	New London, Conn	2		12,500	2.660	166.25		Broke suddenly without cracking	Do.
Do	do	2	Edge	14,175	2.660	166.25		do	Do.
Do	Millstone Point, Conn	2		17,468	2.706	168.7		Average of two determinations; broke suddenly without cracking.	Do.
Do	Mystic River, Conn	2	Bed	18,125	2.630	164.4		Broke suddenly without cracking	Do.
Do	do	2	Edge	22,250	2.630	164.4		do	Do.
Do	Stony Creek, Conn	2	Bed	15,000	2.645	165.4	1/50	Burst suddenly	Do.
			Edge	16,750					
Do	do	2	Bed	15,750	2.645	165.4	1/50		Do.
Granite	Milford, Conn	5.93×5.93×6.97		22,610					Watertown Arsenal Mass.
Do	do	5.95×5.95×5.93×		23,600					Do.
Biotite granite	Vinalhaven, Me	2		13,381	2.660	166.3		Average of two determinations; broke suddenly without cracking.	Gillmore.
Do	do	2		14,950	2.720	170		Average of two determinations	Do.
Do	do	2	Bed	16,031	2.630	164.4		Finely marked; blush	Do.
Do	do	2	Bed	18,000	2.630	164.4		Finely marked	Do.
Do	do	2	Bed	15,606	2.608	163		Average of six determinations; boldly marked; resembling fine breccia.	Do.
Do	Fox Island (Vinalhaven), Me.	2		14,875	2.631	164.1		Burst suddenly	Do.
Do	Dyer's Island, Me	2	Bed	18,000	2.620	163.7		Average of two determinations; boldly marked, resembling fine breccia.	Do.
Do	City Point, Me	2	Bed	15,046	2.650	165.6		do	Do.
Do	Dix Island, Me	2		15,000	2.635	166.5		Burst suddenly	Do.
Do	Jonesboro, Me			13,164					Richards.
Do	Spruceheud, Me	2		15,500	2.750	171.9		Average of two determinations; broke suddenly without cracking.	Gillmore.

Do	Hewitt's Island, Me	2		14,718	2.634	164.6		do	Do.
Do	Hurricane Island, Me	2	Bed	14,425	2.670	166.9			Do.
Do	do	2	Edge	14,937	2.670	166.9		Burst suddenly	Do.
Do	do	2	Bed	11,000	2.670	166.9		Split off considerably before bursting	Do.
Granite	Huron Island, Mich	2	Bed	18,125	2.630	164.4	[illegible]		Do.
Do	do	2	Bed	20,650	2.66	166.2	[illegible]		Do.
Do	do	2	Edge	14,425	2.62	163.7	[illegible]	Soaked a week for absorption	Do.
Hornblende granite	East Saint Cloud, Minn	2	Bed Edge	28,000 26,250	2.632	163.2	Trace.		Do.
Do	Saint Cloud, Minn	2	Bed Edge	16,000 18,500	2.69	168.2	[illegible]		Do.
Do	East Saint Cloud, Minn	2	Bed Edge	28,000 26,250	2.609	163.1	[illegible]		Do.
Do	do	2	Bed Edge	26,250 25,750	2.609	163.1	[illegible]		Do.
Do	Watab, Minn	2	Bed Edge	25,000 23,750	2.650	168.4	[illegible]		Do.
Do	do	2	Bed	25,750	2.606	162.8	[illegible]		Do.
Do	Sauk Rapids, Minn	2	Bed Edge	21,500 25,000	2.683	167.7	[illegible]		Do.
Do	Beaver Bay, Minn	2	Bed Edge	26,500 25,750	2.608	162.7	[illegible]		Do.
Biotite granite	Port Deposit, Md	2	Bed Edge	19,750 13,100	2.720	170		Coarse; strongly dashed with black.	Do.
Do	do	2	Bed	15,750	2.720	170		Average of two determinations	Do.
Hornblende granite	Cape Ann, Mass	2	Bed	12,428				Broke suddenly without cracking	Do.
Do	do	2	Bed	19,500				do	Do.
Do	Rockport, Mass	2	Bed Edge	16,300 19,750	2.610	163.2	[illegible]		Do.
Do	Quincy, Mass	2		17,750	2.660	166.2		Cracked before bursting	Do.
Do	do	2		14,750	2.695	168.7		do	Do.
Biotite granite	Fall River, Mass	2	Bed Edge	15,937 9,250	2.635	165	[illegible]	Burst suddenly, first split vertically.	Do.
Granite	Monson, Mass	7.6 × 7.4	Bed	15,890					Watertown Arsenal, Mass.
Do	do	6 × 6.1 × 7½	Edge	12,720					Do.
Biotite granite	Keene, N. H	2	Bed	10,875	2.656	166	[illegible]	Used in inside of new capitol, Albany, N. Y.	Gillmore.
Do	do	2	Bed	12,875	2.656	166	[illegible]		Do.
Biotite gneiss	Tarrytown, N. Y	2	Bed	18,250	2.655	162.2		Cracked before bursting	Do.
Do	Morrisania, N. Y	2		15,800	2.720	170		Broke suddenly without cracking	Do.
Biotite granite?	Staten Island, N. Y	2	Bed	22,250	2.861	178.8		Cracked before bursting	Do.
Granite?	North River, N. Y	2	Edge Bed	12,250 12,370	2.580	161.3	[illegible]		Do.
Gneiss	Madison avenue, N. Y	2	Bed	11,250	2.920	182.5			Do.
Do	do	2	Edge	12,500	2.920	182.5			Do.
Granite	Chanmont Bay, N. Y	2	Bed	18,770	2.65	165.4	[illegible]	Soaked a week for absorption	Do.
Biotite granite	Westerly, R. I	2	Bed	14,687	2.670	166.9		Broke suddenly without cracking	Do.
Do	do			17,184					Richards.
Do	do	2	Edge	14,937	2.670	166.9		Broke suddenly without cracking	Gillmore.

(3) TABLE SHOWING THE SPECIFIC GRAVITY, STRENGTH PER SQUARE INCH, ETC.—Continued.

Kind of stone	Locality.	Size of cube.	Position.	Strength per square inch.	Specific gravity.	Weight per cubic foot.	Ratio of absorption.	Remarks.	Authority.
		Inches.		*Pounds.*		*Pounds.*			
Biotite granite	Westerly, R. I	2		17,500	2.646	165.6		Average of two determinations	Gillmore.
Do	Richmond, Va	2	Bed	14,100	2.630	164.4	1/25	Broke suddenly without cracking	Do.
			Bed	13,875					
Do	do	2		19,104	2.727	170.5		Average of three determinations; broke suddenly without cracking.	Do.
Hornblende granite	Bay of Fundy, New Brunswick	2	Bed	11,916	2.600	162.5		Average of two determinations	Do.
Diabase	New Haven, Conn	2	Edge	7,750	2.600	162.5	1/25	Waxy looking, having a resinous luster, burst suddenly	Do.
			Bed	2,500					
Gabbro	Duluth, Minn	2	Edge	17,187					Do.
Do	do	2	Bed	17,631	2?800	175		Average of four determinations	Do.
Gabbro?	do	2	Bed	27,250	2.802	175.1	1/25		Do.
			Edge	26,250					
Diabase	Taylor's Falls, Minn	2	Bed	26,250	3.000	187.5	(*)		Do.
			Edge	26,250					
Labradorite (massive)	Beaver Bay, Minn	2	Bed	20,750	2.704	169	1/25		Do.
			Edge	20,750					
Diabase	Near Duluth, Minn	2	Bed	26,250	3.005	187.8	1/25		Do.
			Edge	26,250					
Do	Jersey City Heights, N. J	2	Bed	21,500	3.03	189.5		Very dark color; average of two determinations.	Do.
Do	Pompton, N. J	2	Bed	24,040				Average of three tests, taken from near the surface.	Do.
Do	Goose Creek, Loudoun County, Va.	1		23,000					U. S. Ordnance Department.
Limestone [marble]	Canaan, Conn			5,812					
Dolomite	Joliet, Ill	2	Bed	14,775	2.56	160	1/25	Average of three trials; burst without cracking.	Gillmore.
Limestone?	Quincy, Ill	2	Bed	9,687	2.570	160.6	1/25	Crushed with loud explosion	Do.
Do	do	2	Edge	9,787	2.510	156.9	1/25	do	Do.
Dolomite	Lemont, Ill	2	Bed	12,000	2.645	165.3	1/25	Burst without cracking	Do.
Do	do	2	Edge	14,000	2.645	165.3	1/25	do	Do.
Limestone	Putnamville, Ind			11,750		158.36	1/25		Geology of Indiana, 1878, p. 88.
Do	Greensburgh, Ind			16,875		169.99	1/25		Geology of Indiana, 1878, p. 90
Do	Near Saint Paul, Ind			16,000		168.09	1/25		Geology of Indiana, 1878, p. 91.
Do	Harrison County, Ind			10,250		149.59	1/25		Geology of Indiana, 1878, p. 95.
Do	Mount Vernon, Ind			15,750		165.43	1/25		Geology of Indiana, 1878, p. 89.

Do	Bloomington, Ind			13,750		137.24	½		Geology of Indiana, 1878, p. 96.
Limestone (oolitic)	Spencer, Ind			7,500		140	½		Geology of Indiana, 1878, pp. 96, 97.
Do	do			8,750		145.16	½		Do.
Do	Ellettsville, Ind			13,500		142.23	½		Do.
Do	do			13,628		152.89	½		Do.
Do	Bedford, Ind			6,500		147.03	½		Do.
Do	do			10,125		152.39	½		Do.
Do	do			6,750		140.8	½		Do.
Do	Salem, Ind			8,625		144.28	½		Do.
Limestone†	Bardstown, Ky	2	Bed	16,250	2.67	166.9	½	Used for Louisville and Portland Canal.	Gillmore.
Do	do	2	Edge	15,000	2.67	166.9	½	do	Do.
Dolomite. [Marble]	Lee, Mass	5.91× 5.92× 5.92	End	22,960				Sustained maximum load of testing-machine without apparent injury.	Watertown Arsenal, Mass.
Do	do	5.91× 5.91× 5.90	Bed	22,009				Flaked off along one edge	Do.
Do	do	5.89× 6.00× 5.90	Bed	21,700				Crushed suddenly with report	Do.
Dolomite	do	5.9 × 5.91× 5.90*	End	20,564				Burst into fragments suddenly	Do.
Do	do	5.93× 5.93× 5.93	Bed	22,370				Effect of loading, slight flaking of one face of block; did not break.	Do.
Dolomite. [Marble]	do	5.92× 5.93× 5.91	End	22,620				Sustained maximum load of testing-machine without perceptible injury	Do.
Limestone†	Marquette, Mich	2	Edge	7,850	2.34	146.2	½	Average of two trials	Gillmore.
Do	do	2	Bed	7,285	2.34	146.2	½	Burst without cracking	Do.
Do	Lime Island, Mich	2	Bed	19,475	2.54	159	½	Average of three trials; burst without cracking.	Do.
Dolomite	Frontenac, Minn	2	Bed	11,250	2.421	151.3	½		Geol. of Minn., vol. 1, p. 198.
			Edge	12,500					
Do	Stillwater, Minn	2	Bed	25,500	2.762	172.6	½		Do.
			Edge	25,000					
Do	Winona, Minn	2	Bed	16,250	2.450	153.1	½		Do.
			Edge	16,250					
Dolomitic limestone	Red Wing, Minn	2	Bed	23,000	2.595	162.2	½		Do
			Edge	23,250					
Do	Stillwater, Minn	2	Bed	10,750	2.567	160.4	½		Do
			Edge	12,750					
Do	Kasota, Minn	2	Bed	18,500	2.519	157.4	½		Do
			Edge	16,750					
Do	Mantorville, Minn	2	Bed	9,500	2.310	144.3	½		Do.
			Edge	10,000					

* Scarcely appreciable.

(3) TABLE SHOWING THE SPECIFIC GRAVITY, STRENGTH PER SQUARE INCH, ETC.—Continued.

Kind of stone.	Locality.	Size of cube.	Position.	Strength per square inch.	Specific gravity.	Weight per cubic foot.	Ratio of absorption.	Remarks.	Authority.
		Inches.		*Pounds.*		*Pounds.*			
Limestone†	Billingsville, Mo	2	Bed	6,650	2.32	145	1/3	Burst without cracking	Gillmore.
Do	do	2	Edge	7,250	2.32	145	1/3	do	Do.
Do	Canton Mo	2	Bed	7,500	2.34	146	1/3	Average of four trials	Do.
Magnesian limestone	Glen's Falls, N. Y	2	Bed	11,475	2.790	168.8		Burst without cracking	Do.
Do	do	2	Edge	10,750	2.700	168.8		do	Do.
Do	Lake Champlain, N. Y	2	Bed	25,000	2.75	171.9		do	Do.
Do	do	2	Edge	21,500	2.75	171.9		do	Do.
Do	Canajoharie, N. Y	2	Bed	20,700	2.685	169.6		do	Do.
Do	do	2	Edge	19,250	2.685	169.6		do	Do.
Limestone‡	Kingston, N. Y	2	Bed	13,900	2.69	168.2		do	Do.
Do	do	2	Edge	11,050	2.69	168.2		do	Do.
Do	Garrison's Station, N. Y	2	Bed	18,500	2.635	164.7		do	Do.
Do	do	2	Edge	18,275	2.635	164.7		do	Do.
Do	do	2	Bed	18,092	2.61	163.0		Average of three trials	Do.
Do	Williamsville, N. Y	2	Bed	12,250	2.64	165		Burst without cracking	Do.
Do	do	2	Edge	12,375	2.64	165		do	Do.
Dolomite. [Marble]	Tuckahoe, N. Y	2	Bed	13,076	2.837	177.6		Average of four trials, burst without cracking.	Do.
Bituminous dolomite	Marblehead, Ohio	2	Bed	11,517	2.42	152	1/3	Average of three trials	Do.
Limestone. [Marble]	Montgomery County, Pa.	6.55×6.06×6.02	Bed	13,700					Watertown Arsenal, Mass.
Do	do	6.50×6.05×6.03	End	10,120					Do.
Do	do	6.04×6.00×6.01	End	9,000				Probable reduction in strength from uneven bearing.	Do.
Do	do	6.00×6.01×6.0	Bed	10,940					Do.
Do	do	6.4×6.35×6.02	Bed	11,470				Failed immediately after first signs of rapid yielding.	Do.
Do	do	6.00×6.40×6.02	End	10,420				No signs of failure till block burst	Do.
Limestone	Conshohocken Pa	5.94×5.90×5.92	End	14,090				Block split up along stratification	Do.

Do	do	5.92× 5.85× 5.92	Bed	16,340				Failed immediately after first signs of weakness.	Do.
Limestone. [Marble]	Vermont	5.50× 6.01× 6.01	Bed	13,400					Do.
Do	Dorset, Vermont	2	Edge	3,070	2.683	167.3		Crushed with slight explosion	Gillmore.
Do	do	2	Bed	7,612	2.635	164.7	1/175	do	Do.
Limestone ?	Door County, Wis	2	Bed	20,025	2.800	175		Crushed with quiet explosion	Do.
Do	do	2	Edge	13,700	5.800	175		Crushed with slight explosion; sand cracks.	Do.
Do	Big Sturgeon Bay, Wis	2	Bed	21,500	2.78	173.6	1/[illegible]	A remarkably solid, stable stone	Do.
Do	do	2	Edge	16,687	2.75	171.9	1/[illegible]	Burst without cracking	Do.
Limestone (Tertiary)	Caen, France	2	Bed	3,550	1.900	118.6	1/16	Average of two trials; burst without cracking.	Do.
Limestone. [Marble]	Italy	2	Bed	12,150	2.690	168.2		Burst without cracking	Do.
Sandstone	Middletown, Conn	2	Bed Edge	6,950 5,550	2.360	148.5	1/40		Do.
Do	Portland, Conn	2	Bed	4,945					
Do	East Long Meadow, Mass			8,812					
Do	Marquette, Mich	2	Bed	6,165	2.225	142.8	1/[illegible]	Average of two trials	Gillmore.
Do	do	2	Edge	5,550	2.285	142.8	1/[illegible]		Do.
Do	do	2	Bed	6,328	2.166	135.3	1/20	Average of three trials	Do.
Do	do	2	Edge	5,240	2.165	135.3	1/[illegible]	Average of two trials	Do.
Do	Hinckley, Minn	2	Bed Edge	19,000 17,500	2.529	139.3	1/17		Do.
Do	Near Fort Snelling, Minn	2	Bed Edge	14,250 20,000	2.231	138.8	1/16		Do.
Do	Dresbach, Minn	2	Bed Edge	6,500 3,750	1.880	117.5	1/8		Do.
Do	Jordan, Minn	2	Bed Edge	3,750 3,000	1.825	113.1	1/8		Do.
Do	Fond du-Lac, Minn	2	Bed Edge	8,750 5,750	2.245	141.3	1/16		Do.
Do	Jordan, Minn	2	Bed Edge	4,750 4,000	1.961	118.9	1/8		Do.
Do	Dakota, Minn	2	Bed Edge	4,750 3,000	1.872	117.	1/8		Do.
Do	Taylor's Falls, Minn	2	Bed Edge	5,500	1.876	117.2	1/8		Do.
Do	Kasota, Minn	2	Bed	10,700	2.630	164.4	1/[illegible]	Calcareous sandstone	Do.
Do	do	2	Edge	11,675	2.630	164.4	1/[illegible]		Do.
Do	Frontenac, Minn	2	Bed	6,250	2.325	145.3	1/[illegible]		Do.
Do	do	2	Edge	7,775	2.325	145.3	1/[illegible]		Do.
Quartzite	Pipe Stone, Minn	2	Bed Edge	27,750 27,000	2.729	170.6	1/[illegible]		Do.
Sandstone	Warrensburgh, Mo	2	Bed	4,968	2.140	133.7	1/[illegible]		Do.
Do	Bellville, N. J	2	Bed Edge	11,700 10,250	2.259	141	1/[illegible]	Broke suddenly	Do.
Do	Little Falls, N. Y	2	Bed Edge	9,850 9,150	2.259	140.6	1/[illegible]		Do.

(3) TABLE SHOWING THE SPECIFIC GRAVITY, STRENGTH PER SQUARE INCH, Etc.—Continued.

Kind of stone.	Locality.	Size of cube.	Position.	Strength per square inch.	Specific gravity.	Weight per cubic foot.	Ratio of absorption.	Remarks.	Authority.
		Inches.		*Pounds.*		*Pounds.*			
Sandstone	Haverstraw, N. Y.	2	Bed	4,350	2.130	133.1	$\frac{1}{15}$		Gillmore.
Do	Hudson River, N. Y	2	Bed Edge	9,000–13,000 11,482					Probasco.
Do	Albion, N. Y	2	Bed	13,500	2.420	151.2	$\frac{1}{25}$		Gillmore.
Do	do	2	Edge	11,310	2.420	151.2	$\frac{1}{25}$		Do.
Do	Haverstraw, N. Y	2	Edge	4,025	2.130	133.1	$\frac{1}{15}$		Do.
Do	Medina, N. Y	2	Bed	17,250	2.410	150.6	$\frac{1}{25}$	Lilac in color	Do.
Do	do	2	Edge	14,812	2.290	143.3	$\frac{1}{25}$	More purple than last	Do.
Do	do	2	Bed	17,725	2.420	151.1	$\frac{1}{15}$		Do.
Do	Wadesborough, N. C.	1.98×1.97×2		8,000				Cracked at 32,000 pounds; crushed at 44,675 pounds.	
Do	do	1×1.97		9,850					Gillmore.
Do	Vermilion, Ohio	2	Bed	7,840	2.160	135.2	$\frac{1}{15}$	Average of five trials	Do.
Do	do	2	Edge	6,575	2.157	134.8	$\frac{1}{15}$		Do.
Do	Seneca, Ohio	2	Bed	9,587	2.395	149.7	$\frac{1}{15}$		Do.
Do	do	2	Edge	10,500	2.390	149.3	$\frac{1}{15}$		Do.
Do	Cleveland, Ohio	2	Bed	6,800	2.240	140	$\frac{1}{15}$		Do.
Do	do	2	Edge	7,810	2.240	140	$\frac{1}{15}$		Do.
Do	Marblehead, Ohio	2	Bed	7,987	2.310	144.4	$\frac{1}{15}$	Rather a chalky limestone	Do.
Do	do	2	Edge	6,850	2.310	144.4	$\frac{1}{15}$	do	Do.
Do	Massillon, Ohio	2	Bed	7,737	2.110	131.8	$\frac{1}{15}$	Average of two trials	Do.
Do	North Amherst, Ohio	2	Edge	5,450	2.140	133.7	$\frac{1}{15}$		Do.
Do	do	2	Bed	6,312	2.175	135.8	$\frac{1}{15}$	Average of two trials	Do.
Do	Berea, (?) Ohio	6.03×6.52×6.03	Bed	6,510					Watertown Arsenal, Mass.
Do	Berea, Ohio	2	Bed	10,250	2.110	131.9	$\frac{1}{15}$	Very friable, like sugar	Gillmore.
Do	do	2	Bed	8,222	2.145	134	$\frac{1}{15}$	Average of four trials	Do.
Do	Hummelstown, Pa	6.45×6.40×6.04	Bed	13,810					Watertown Arsenal, Mass.
Do	do	6.45×6.50×6.02	End	13,810				Burst suddenly	Do.
Do	Bass Island, Wis	2	Bed	4,850	2.040	127.5	$\frac{1}{15}$	Average of two trials	Gillmore.
Do	do	2	Edge	4,287	2.040	127.5	$\frac{1}{15}$		Do.
Do	Fond du Lac, Wis	2	Bed	6,237	2.220	138.8	$\frac{1}{15}$	Average of two trials	Do.
Do	do	2	Edge	5,110	2.220	138.8	$\frac{1}{15}$		Do.

Do	Dorchester, New Brunswick.	2	Bed	9,281					Do.
Do	do	2	Edge	6,050					Do.
Do	Edinburgh (Craigleith), Scotland.	2	Bed	12,000	2.269	141.8	½		Do.
Do	do	2	Edge	11,250	2.269	141.8	½		Do.
Do	Anan, Scotland	6		7,925	2.262	141.8	½		
Do	Verte Island, Lake Superior.	2		11,342					

(4) TABLES SHOWING THE CHEMICAL COMPOSITION OF STONES OF VARIOUS KINDS.

Serpentinous rocks.	Silica.	Magnesia.	Chromic oxide.	Niccolous oxide.	Ferrous oxide.	Manganous oxide.	Alumina.	Water.	Magnetic iron.	Authority.
Serpentine, near Dublin, Harford County, Md	40.06	39.02	0.20	0.71	3.43	0.09	1.37	12.10	3.02	F. A. Genth.
					Ferric oxide.					
Precious serpentine, Easton, Pa	41.55	40.15	.....	.....	3.90	.....	.....	13.70	.....	Mineralogy of Pennsylvania, preliminary report, 1874, p. 116.
Serpentine var. Williamsite, Lancaster County, Pa	45.92	37.75	.....	.....	.....	.....	3.35	13.01	.....	Mineralogy of Pennsylvania, preliminary report, 1874, p. 116 (Brush).
						$CaCO^3$.				
Serpentine (verdantique marble) Roxbury, Vt	42.60	35.50	.....	.....	3.30	.60	.....	13.00	.....	Geology of Vermont, Vol. II, p. 779.
Serpentine (verdantique marble) Cavendish, Vt	43.39	39.55	.....	.....	5.32	.....	.....	11.79	.....	Do.

Limestones and dolomites other than marbles.	Carbonate of lime.	Carbonate of magnesia.	Oxides of iron.		Oxide of aluminum.	Silica and insoluble residue.	Water and loss.	Sulphuric acid.	Chlorides of alkalies.	Authority.
			Ferric.	Ferrous.						
Limestone, Nauvoo, Ill	82.48	.....	.....	2.10	.....	12.50	2.92	.....	.....	Prof. A. D. Conover.
Dolomite, Lemont, Ill	45.80	.....	2.30	.....	7.00	15.90	6.90	0.38	2.85	Geology of Indiana, 1878, p. 92.
								Potash.	Soda.	
Do	42.97	34.30	.....	2.07	.....	21.36	.....	0.21	0.23	Geology of Minnesota, Vol. I.
Limestone (oolitic), Belford, Ind	96.60	0.13	.....	0.98	.....	0.50	0.96	0.31	0.40	Geology of Indiana, 1878, p. 95.
Limestone (oolitic), Spencer, Ind	96.80	0.11	.....	0.91	.....	0.70	0.92	0.20	0.32	Do.
Limestone, Bloomington, Ind	95.54	0.19	1.90	.....	.....	0.65	1.57	0.40	0.55	Do.
Limestone, North Vernon, Ind	89.40	0.35	1.00	.....	2.20	1.75	2.66	1.21	Trace...	Geology of Indiana, 1878, p. 89.
Limestone, Harrison County, Ind. (Stocklager's quarry)	98.10	None	0.18	.....	0.14	0.31	0.62	0.25	0.40	Geology of Indiana, 1878, p. 95.
Limestone, Flat Rock Creek, near Saint Paul, Ind	82.71	3.00	1.00	.....	2.40	5.10	1.00	0.80	0.50	Geology of Indiana, 1878, p. 91.
Limestone, Greenbury, Ind	74.20	4.93	2.50	.....	3.70	5.90	0.85	0.90	1.60	Geology of Indiana, 1878, p. 90.
Siliceous limestone, Putnamville, Ind	63.76	0.33	2.00	.....	1.70	27.50	1.86	2.60	0.75	Geology of Indiana, 1878, p. 98.
Magnesian limestone, Anamosa, Iowa	57.32	41.21	.....	0.28	.....	0.72	0.31	.....	.....	Geology of Iowa, Vol. II, pp. 346, 347.
Magnesian limestone, Le Claire, Iowa	54.23	41.70	.....	0.74	.....	3.33	.....	.....	.....	Do.

Magnesian limestone, Le Grand, Iowa	75.42	20.96		1.68		1.71	0.59			Do.
Magnesian limestone, Stone City, Iowa	57.86	37.20		1.29		0.98				Geology of Minnesota, Vol. I.
Limestone (lithographic), Solenhofen, Bavaria	98.24	0.21							Carbonate of iron 2.03	Gmelin, Chateau, Vol. I, p. 295.
Limestone (oolitic), Bath, England	97.52	2.50		1.20			1.78			Wheatstone & Daniels, Hull, p. 210.
Limestone (oolitic), Portland, England	95.16	1.20		0.59		1.20	1.94			
Limestone (Caen), Aubigney, France	97.00					1.70				
Dolomitic limestone, Minneapolis, Minn. (Weeks & Helscher's quarry).	54.533	38.062	0.90		3.16	16.22	0.375			Geology of Minnesota, Vol. I.
Dolomitic limestone, Minneapolis, Minn. (Foley & Herbert's quarry).	41.880	24.550	4.03			29.93		Potash. 1.22	Soda. 1.12	Do.
Dolomitic limestone, Minneapolis, Minn. (Eastman's quarry).	75.492	6.310		1.70		14.45	1.60			Do.
Argillaceous limestone, Saint Paul, Minn. (A. Rana's quarry)	78.18	6.430	1.68		2.67	13.39			Organic matter. 0.90	Do.
Dolomitic limestone, Kasota, Minn. (Breckenridge Bros.' quarry).	47.904	35.257	1.49			13.86				Do.
Dolomitic limestone, Kasota, Minn	49.16	37.53		1.09		13.06		Potash. 0.92	Soda. 0.50	Do.
Dolomitic limestone, Clinton Falls, Minn	57.66	15.90		1.94		25.51				Do.
Dolomitic limestone, Central Point, Minn	33.66	18.546	0.33		4.92	38.52				Do.
Dolomitic limestone, Lanesboro, Minn. (Mill Co.'s quarry).	49.66	42.06	0.37		0.22	3.48		0.02	Soda. 00.30	Do.
Dolomitic limestone, Red Wing, Minn. (Sweeney's quarry).	50.69	33.61	0.55		0.37			0.15	Soda. 0.68	Do.
Dolomitic limestone, Lanesboro, Minn. (Mill Co.'s quarry).	62.14	28.49		1.05		7.35		0.02	Soda. 0.24	Do.
Dolomitic limestone, Stillwater, Minn. (Hersey & Co.'s quarry).	50.22	37.39	0.75		0.64	8.54			Soda. 0.28	Do.
Do	53.50	40.21		1.11		4.52			Soda. 0.21	Do.
Dolomitic limestone, Mantorville, Minn. (Hooke's quarry).	50.20	38.96		1.77		8.33			Soda. 10.6	Do.
Dolomite, Winona, Minn	51.29	41.39		0.98		6.32		0.12	Soda. 0.22	Do.
Dolomite, Frontenac, Minn	54.76	42.53	0.36		0.31	2.96		0.03	0.18	Do.
Limestone, Fountain, Minn	88.197	9.479		1.30		0.89		0.44		
Limestone, Point Pleasant, [illegible]	79.30	0.91		7.00		12.00				Geology of Ohio, Vol. I, p. 374.

(4) TABLES SHOWING THE CHEMICAL COMPOSITION OF STONES OF VARIOUS KINDS—Continued.

Limestones and dolomites other than marbles.	Carbonate of lime.	Carbonate of magnesia.	Oxides of iron.		Oxide of aluminum.	Silica and insoluble residue.	Water and loss.	Sulphuric acid.	Chlorides of alkalies.	Authority.
			Ferric.	Ferrous.						
Limestone, Dayton, Ohio	92.40	1.10		0.58		1.70	1.08	Soluble silica. 0.90		Geology of Ohio, Report of Progress, 1869, p. 152.
Limestone, Xenia, Ohio	84.50	11.16		2.60		2.20				Geology of Ohio, Vol. II, part 1, p. 669.
Magnesian limestone, Marblehead, Ohio	83.20	15.83				0.15	9.89		Organic matter. 0.02	J. L. Cassels.
Argillaceous dolomite, Yellow Springs, Ohio	51.10	41.12		1.40		5.40				Geology of Ohio, Vol. II, part 1, p. 672.
Dolomite, Greenfield, Ohio	53.67	42.42	1.30			2.44				Geology of Ohio, Report of Progress, 1870, p. 287.
Dolomite, Springfield, Ohio	54.70	44.98		0.20		0.10				Geology of Ohio, Vol. I, part 1, p. 474.

(4) TABLES SHOWING THE CHEMICAL COMPOSITION OF STONES OF VARIOUS KINDS—Continued.

Limestones and dolomites, marbles.	Carbonate of lime.	Carbonate of magnesia.	Oxides, iron and aluminum.	Insoluble residue.	Carbonate of manganese.	Carbonate of iron.	Loss.	Authority.
Limestone (white), Talladega County, Ala.	95.25	0.62	1.15	*a*2.95	.....	.....	.....	Geology of Alabama, Report of Progress for 1874, p. 131.
Limestone (blue), Talladega County, Ala..	94.40	0.41	0.75	*a*4.65	.....	.....	.....	Do.
Dolomite (white), Lee, Mass.....	54.621	43.932	.365	.....	.....	.....	.610	Joseph Henry. Smith. Report.
Dolomite (white), Pleasantville, N. Y	64.62	45.04	0.23	.....	.....	.....	.....	C. F. Chandler.
Limestone (pink), Nantehala River, North Carolina.	94.51	2.12	.....	*b*2.56	0.21	0.60	.....	F. A. Genth, Geology of North Carolina, Vol. I, 1875, p. 138.
Limestone (white), Valley River, North Carolina.	97.86	1.29	.....	*b*0.44	0.18	0.23	.....	Do.
Dolomite (white), Valley River, North Carolina.	54.10	44.44	.....	*b*0.32	0.52	0.62	.....	Do.
					Sulphur.	Organic matter.		
Limestone, Knoxville, Tenn.....	98.43	0.30	.31	.38	.014	.0680	.150	
Limestone (white statuary), Brandon, Vt.	99.51	.....	.....	.29	.....	.....	.20	Geology of Vermont, Vol. II, p. 768.
Limestone (magnesian), Isle La Motte, Vt.	87.94	4.56	2.60	4.80	Mn O trace	.....	.10	Do.
Dolomite, Plymouth, Vt.....	53.90	44.7	.....	1.3	.....	.....	.....	Geology of Vermont, Vol. II, p. 775.
Dolomite, Colchester, Mallett Bay, Vt	35.31	42.23	12.25	10.30	.....	.....	.....	Do.
Limestone (white), Rutland, Vt.....	97.73	.....	.59	1.68	.....	.....	.....	Geology of Vermont, Vol. II, p. 774.
Limestone (greenish), Rutland, Vt	85.45	.....	.....	14.55	.....	.....	.....	Geology of Vermont, Vol. I, p. 397.
Limestone, Sudbury, Vt.....	99.70	.....	.30	.....	.....	.....	.....	Do.
Limestone (white), West Rutland, Vt.....	98.00	.....	.....	.57	.....	.....	.....	Do.
Limestone (dove colored), Swanton, Vt....	94.66	.23	1.09	2.39	.....	.....	1.63	Geology of Vermont, Vol. II, p. 691.
Limestone (white), Carrara, Italy.....	99.236	0.284	.....	.....	.....	.....	.....	Wittstein, quoted by Chateau, Vol. I, p. 294.
Do.....	98.765	0.900	1.082	0.16	.....	.....	0.096	P. M. Kaeffel, quoted in Sill. Jour., Vol. XV, 1853, p. 434.

a Siliceous matter.

b Quartz and silicates.

(4) TABLES SHOWING THE CHEMICAL COMPOSITION OF STONES OF VARIOUS KINDS—Continued.

Granites.	Silica.	Alumina.	Iron oxides.	Manganese oxide.	Lime.	Magnesia.	Potash.	Soda.	Loss.	Sulphur and copper.	Authority.
Granite, Monson, Mass. (light)	73.47	15.07	1.15	.....	4.48	.12	0.38	5.59	.....	Trace...	J. M. Ordway.
Granite, Monson, Mass. (dark)	69.35	18.83	2.00	.....	5.94	.....	3.78		.....	.....	Do.
Hornblende granite, East Saint Cloud, Minn.	65.12	16.96	4.69	.....	4.77	1.99	2.18	3.07	.....	.....	N. H. Winchell, Geology of Minnesota, Vol. I.
Hornblende granite, Sauk Rapids, Minn.	64.13	21.01		.....	6.90	1.26	1.22	3.31	.....	.....	Do.
Hornblende granite, Beaver Bay, Minn.	71.81	12.82	6.02	.....	2.26	0.56	1.92	2.51	.....	.....	Do.
Hornblende granite, East Saint Cloud, Minn.	74.43	12.68	3.82	.....	1.28	0.25	2.33	1.55	.....	.....	Do.
Do	74.72	12.80	3.19	.....	1.51	0.25	2.25	1.91	.....	.....	Do.
Hornblende granite, Watab, Minn	62.66	19.29	4.67	.....	5.98	3.06	1.62	2.45	.....	.....	Do.
Do	78.12	11.14	2.68	.....	.62	Trace	4.48	3.33	.....	.....	Do.
Biotite granite, Raleigh, N. C	69.28	17.44	2.30	0.16	2.30	0.27	2.76	3.64	.....	.....	Geology of North Carolina, Vol. I, 1875.
Hornblende biotite granite, Utah	71.78	14.75	1.94	1.09	2.36	0.71	4.89	3.12	0.52	.....	Geological Exploration Fortieth Parallel, Vol. II, p. 356.
QUARTZ PORPHYRIES.											
Quartz porphyry, Waterville, N. H	63.63	17.42	5.91	0.22	2.86	.....	5.54	4.52	0.15	.....	Geology of New Hampshire, Vol. III.
Quartz porphyry "leopardite," Mecklenburgh, N. C.	75.92	14.47	0.88	0.09	1.02	.....	4.01	4.96	0.64	.....	American Journal of Science, March, 1862, p. 199.

(4) TABLES SHOWING THE CHEMICAL COMPOSITION OF STONES OF VARIOUS KINDS—Continued.

Diabase.	Silica.	Oxides of iron.		Alumina.	Oxide of manganese.	Magnesia.	Soda.	Potash.	Lime.	Phosphoric acid.	Ignition and loss.	Authority.
		Ferric.	Ferrous.									
Diabase, West Rock, New Haven, Conn.	51.78	3.59	8.25	14.20	0.44	7.63	2.14	0.39	10.70	0.14	0.63	Hawes, American Journal of Science, Vol. IV, 3ed., 1875, p. 186, 187.
Diabase, Mount Holyoke, Mass	52.68	1.95	9.79	14.14	0.44	6.38	2.56	0.87	9.38	.....	1.60	Do.
Diabase, Duluth, Minn	50.43	17.63		23.83	.....	2.46	2.06	0.34	4.79	.....	.....	Geology of Minnesota, Vol. I, p. 198.
Gabbro, Duluth, Minn	48.51	19.34		13.79	.....	4.81	1.67	0.19	8.34	.....	.....	Do.
Diabase, Taylor's Falls, Minn	35.83	48.45			.....	3.12	1.66	0.22	9.35	.....	.....	Do.
Massive labradorite, Beaver Bay, Minn.	48.32	35.95			.....	0.25	2.98	0.19	12.65	.....	.....	Do.
Diabase, Jersey City, N. J	53.13	1.08	9.10	13.74	0.43	8.55	2.30	1.03	9.47	.....	0.90	Hawes, American Journal of Science, Vol. IV, 1875, p. 187.
Diabase, Williamson's Point Pa	50.79	11.28	TiO_2, 0.79	14.19	0.48	7.88	1.89	0.95	9.75	0.15	1.95	F. A. Genth, Rep. E E E, 2d Geology of Pennsylvania, p. 275

(4) TABLES SHOWING THE CHEMICAL COMPOSITION OF STONES OF VARIOUS KINDS—Continued.

Sandstones and quartzites.	Silica.	Alumina.	Iron oxides.	Manganese oxide.	Lime.	Magnesia.	Potash.	Soda.	Loss.	Authority.
Sandstone, Portland, Conn	69.94	13.15	2.48	0.70	3.09	Trace	3.30	5.43	1.01	F. W. Taylor.
Sandstone, Stoney Point, Mich	84.57	5.90	6.48	.....	.....	0.68	Undet.		1.92	F. W. Clark, Bull. U. S. Geological Survey, No. 27.
Quartzite, Pipestone, Minn	84.52	12.33	2.12	.....	.31	Trace	0.11	0.84	2.31	Geology of Minnesota, Vol. I.
Sandstone, Hinckley, Minn	98.69	1.06	.....	.....	.42	0.01	Trace	0.17	.....	N. H. Winchell, Geology of Minnesota, Vol. I.
Sandstone, near Fort Snelling, Minn	97.67	1.31	0.55	.....	.41	0.21	0.02	0.15	.....	Do.
Sandstone, Dresbach, Minn	81.47	8.90		.....	1.90	0.50	4.20	0.39	.....	Do.
Sandstone, Jordan, Minn	81.19	10.44		.....	.56	0.40	3.60	0.66	.....	Do.
Sandstone, Fond du Lac, Minn	78.24	10.88	3.83	.....	.95	1.60	1.67	0.06	.....	Do.
Sandstone, Jordan, Minn	38.41	5.77	1.79	.....	35.87	Mg_2CO_3 18.54	0.12	0.29	.....	Do.
Sandstone, Dakota, Minn	81.55	10.00	1.41	.....	1.15	Magnesia 0.30	1.76	1.03	.....	Do.
Sandstone, Wadesborough, N. C	69.28	13.84		.....	.....	.02	6.43		1.69	
Sandstone, Berea, Ohio	44.40	7.49	3.87	.....	.74	2.11	0.24	0.56	.....	Do.
Waverly sandstone, Ohio	91.00	5.20	1.47	.....	Trace	0.28	.....	.....	1.80	Professor Wormley, Geology of Ohio.
Sandstone, Cleveland, Ohio	91.67	6.92	Trace	.....	0.28	0.34	.....	.....	1.17	T. M. Chatard, Bull. U. S. Geological Survey, No. 27.
Waverly sandstone, Piketon, Ohio	73.90	8.56	13.44	.....	Trace	0.46	.....	.....	3.30	Professor Wormley.
Sandstone, Siskowit Bay, Wisconsin	90.86	4.76	1.58	.....	15	0.59	1.06	0.45	.....	Do.
Sandstone, Annan, Scotland	95.24	.56	1.28	.....	1.40	1.23	.....	.....	.56	W. Wallace.
Sandstone, Dorchester, New Brunswick	82.52	7.07	3.55	1.42	1.83	Trace	Trace	.....	3.61	J. R. Chilton.

(4) TABLES SHOWING THE CHEMICAL COMPOSITION OF STONES OF VARIOUS KINDS—Continued.

Argillites. Clay slates.	Silicic acid.	Titanic acid.	Sulphuric acid.	Alumina.	Ferrous and ferric oxide.	Manganous oxide.	Cobaltous oxide.	Lime.	Magnesia.	Soda.	Potash.	Carbon.	Water.	Iron bisulphide.	Authority.
Slate, Delta, York County, Pa	55.88	1.27	0.022	21.849	9.034	0.586	Trace	0.155	1.495	0.460	3.640	1.974	3.385	0.051	J. S. McCreath.
Slate	60.50	.....	.....	19.70	7.83	.....	.....	1.12	2.20	2.20	3.18	.....	3.30	.....	Professor Hull.
Slate, Llangynog, North Wales...	60.150	.....	.....	24.200	1.815 5.837	.....	.....	4.278				.....	3.720	.....	D. H. Richards.
Slate, Llanberis	66.45	0.68	.....	13.38	1.41 1.71	.91	.....	2.86	6.28	0.90	0.05	[1]1.30	4.03	.....	Royal School of Mines.
Slate, Nantlle	48	.....	.....	[2]26.	14.00	.....	.....	4	8	.....	.....	.....	.....	.....	Kirwan.
Slate, Bondorf	62.59	.....	.....	16.88	8.42	.....	.....	[3]0.24	2.26	.....	3.31	[4]0.92	4.03	.....	Dr. Bischoff.

[1] Carbonic acid.

[2] Estimated as argillaceous matter.

[3] Contained also 1.22 per cent. of carbonate of lime and 0.18 per cent. of oxide of copper.

[4] Tabled as "Carbon and loss."

APPENDIX B.

PRICES AND COST OF CUTTING.

The prices of stone and the cost of cutting vary with the price of labor and the conditions of the market, hence exact figures can not be given. Those given below are quoted from reliable sources, and will doubtless be found as near correct as possible in a work of this kind. The prices are for the rough stone and at the quarry, ordinary size.

Kinds.	Price per cubic foot.	Cost of dressing per square foot.					Remarks.
		Sawn.	Rubbed	Pointed.	Ax-hammered.	Bush-hammered or chiseled.	
Granites:							
Common	$0.35 to $0.75	.....	.....	$0.25 to $0.40	$0.25 to $0.50	$0.40 to $0.75	
Monumental	.75 to 1.50	.....	.....	.25 to .40	.25 to .50	.40 to .75	
Marbles							
Statuary	7.00 to 9.00	$0.40	$0.80	.25	.50	.75	
Common	1.50 to 2.50	.40	.80	.25	.50	.75	
Decorative	2.00 to 4.00	.40	[illegible]	.25	.50	.75	
Monumental	4.00 to 5.00	.40	.80	.25	.50	.75	
Tennessee	.75 to 3.00	.40	.80	.25	.50	.75	
Sandstones:							
Brown Triassic	1.00 to 2.00	.....	.....	.10 to .15	.20	.....	Extra prices for blocks above 25 cubic feet
Berea	1.00	.....	.....	.....	.....	.....	
N. Y. blue stone	.08 to .10	.....	.....	.15	.....	.25	Per square foot, and 2 to 3 inches thick, flagging
Do	.10 to .20	.....	.....	.....	.....	.....	Per square foot and 4 to 8 inches thick; platforms, etc.
Medina	.60	.....	.....	.....	.....	.....	Building stone.
Limestones	.50 to .75	.....	.....	.....	.....	.....	
Serpentine, Pennsylvania.	.30 to .40	.....	.....	.10	.15	.15	
Slates	2.00 to 3.50	.....	.....	.....	.....	.....	Per square = 100 square feet.

Price-list of Italian marbles.

Quality.	Kind of stone.	Quarry.	Price per cubic foot.	Remarks.
			*Lira.**	
First	Statuary.....	Poggio Silvestro..	35 to 40	Prices reckoned on blocks of sufficient size for an ordinary statue 5 feet in height.
Second...	.....do	....do	15 to 18	
First.....	.....do	Bettogli	30 to 35	
Second...	.....do	....do	12 to 15	
First.....	White or black marble.....	Canal Bianco	10	Prices reckoned on blocks containing not less than 20 cubic feet.
Do.....	.....do	Gioja	9.50	
Second...	.....do	Ravaccione.....	6 to 6.50	
Third	.....do	Tanti Scritti.....	4 to 4.25	
First ...	White veined.....	Vara.....	10.50	
Second...	.....do	Gioja	7	
First.....	Bardiglio	Para.....	8.50	
Second...	.....do	Gioja	6.50	
First.....	Bardiglio, veined	Serravezza.....	8.75	
Second...	.....do	....do	7.25	
First.....	Portor, black and gold.....	Spezia.....	10.50	
Do.....	Red mixed.....	Levanto	10.50	
Do.....	Parmazo.....	Miseglia.....	12	Prices of all of these depend upon the sizes of the pieces and the beauty of the veining.
	.....do	Pescina.....	12	
	.....do	Bocca del Frobbi..	12	
	Yellow	Sienna.....	18 to 20	
	Portor	Monte d'Arma....	11	
	Black.....	Colonnata	10.50	
	Breccia	Gragnana.....	Exceptional.	
	Yellow	....do	....do	
	Green (serpentine).....	Garfagnana.....	....do	
	.....do	Genoa	....do	
	Breccia.....	Serravezza.....	....do	
	Yellow	Verona	....do	
	Red.....	Castel Poggio.....	7	

*A lira equals 19.3 cents American money.

NOTE.—For this list of quarries and prices we are indebted to Hon. William P. Rice, United State consul at Leghorn, Italy.

APPENDIX C.

*IMPORTS AND EXPORTS OF STONE.**

Marbles imported and entered for consumption in the United States for the years 1867 to 1883, inclusive.

Fiscal years ending June 30—	Sawed, dressed, etc., not over 2 inches thick.	Sawed, dressed, etc., over 2 and not over 3 inches thick.	Sawed, dressed, etc., over 3 and not over 4 inches thick	Sawed, dressed, etc., over 4 and not over 5 inches thick	Sawed, dressed, etc., over 5 and not over 6 inches thick	Veined, and all other in block, etc.	White, statuary, breccialla, etc.	Not otherwise specified.	Total.
1867						$192,514	$2,540	$51,978	$247,032
1868						309,750	4,403	85,783	399,936
1869						359,381	3,898	101,309	465,088
1870						332,830	3,713	142,785	479,327
1871	$5,073	$168	$77	$44	$28	400,158	1,134	118,016	525,598
1872	3,490	1,081	452		318	475,718	4,017	54,539	539,624
1873	3,124	21				396,671	4,148	69,991	473,955
1874	1,837					474,580	2,863	51,699	531,079
1875	1,456	427	98			527,628	1,623	72,389	603,619
1876	595	126	204	87		539,126	1,151	60,696	601,885
1877	2,124					349,590	1,404	77,283	430,411
1878	198	11	8			376,936	592	43,915	421,660
1879	184					329,155	427	54,857	384,623
1880						531,908	7,239	62,715	601,862
1881	339					470,047	1,468	87,046	558,900
1882	655					486,331	3,582	84,577	575,145
1883	6.9					533,096	2,011	71,905	607,691

In 1884 the classification was as follows:

	Value.
Marble, in block, rough or squared, of all kinds	$511,267
Veined marble, sawed, dressed, or otherwise, including marble slabs and marble paving tiles	12,941
All manufactures of, not specially enumerated	67,899
Total	592,057

*The tables here given relative to the imports and exports of various kinds of stone are taken bodily from Williams's Mineral Resources of the United States, 1883–'84.

Building stone (exclusive of marble), paving stone, and stone ballast imported and entered for consumption in the United States, 1867 to 1884, inclusive.

Fiscal years ending June 30—	Building stone, dressed.	Building stone, rough.		Sandstone.	Slate, chimney pieces, mantels, etc.	Roofing slate.	Limestone.	Paving stones.	Ballast.	Total value.
		Quantity	Value.							
		Long tons.								
1867	....	....	....	....	$37,510	$85,204	....	....	....	(1)
1868	$50,081	....	....	....	16,045	118,776	....	$5,718	....	(1)
1869	61,408	....	$8,237	$1,171	19,602	85,304	....	467	$3,987	(1)
1870	170,619	....	....	3,201	19,879	107,521	....	2,034	10,518	(1)
1871	145,759	1,455	16,982	3,060	21,381	117,484	....	.	34,703	(1)
1872	162,014	10,723	39,515	7,080	26,935	107,192	$2,459	3,520	11,303	$362,217
1873	218,236	20,226	73,889	6,160	20,643	91,503	1,486	3,788	17,143	438,848
1874	298,680	19,658	81,645	8,534	27,519	80,519	1,639	7,246	21,882	467,664
1875	275,658	15,748	67,357	10,086	42,022	16,942	2,023	2,017	9,025	425,405
1876	316,404	8,190	34,124	7,174	44,266	2,051	1,038	1,005	9,350	410,312
1877	201,034	7,594	25,571	5,402	34,479	4	1,705	485	6,272	275,042
1878	153,693	10,197	37,878	7,130	39,935	275	2,614	1,950	6,989	250,470
1879	125,403	6,845	24,531	13,956	46,200	620	1 456	2,043	2,305	217,024
1880	75,501	11,035	43,997	10,220	51,165	72	2,560	2,382	7,572	193,470
1881	70,741	15,607	65,950	15,115	46,862	2	1,999	3,799	5,401	215,960
1882	104,296	16,778	75,369	.....	45,774	154	2,710	16,599	8,702	253,094
1883	127,476	14,324	64,707	.... ..	44,375	2,813	1,841	2,020	5,745	249,646
1884	122,463	12,198	50,800	.....	34,040	16,009	143	2,576	2,551	229,332

Marble and stone of domestic production exported from the United States.

Fiscal year ending September 30 until 1842 and June 30 since.	Rough	Manufactured.	Total.	Fiscal year ending June 30—	Rough.	Manufactured.	Total.
1826	.....	$13,303	$13,303	1856	.....	$102,370	$102,370
1827	.....	3,505	3,505	1857	.....	111,403	111,403
1828	.....	3,122	3,122	1858	.....	138,590	138,590
1829	.....	2,647	2,647	1859	.....	112,214	112,214
1830	.....	4,655	4,655	1860	.....	176,239	176,239
1831	.....	3,588	3,588	1861	.....	185,267	185,267
1832	.....	3,455	3,455	1862	.....	195,442	195,442
1833	.....	5,097	5,097	1863	.....	38,428	138,428
1834	.....	7,359	7,359	1864	$57,715	44 647	202,362
1835	.....	8,687	8,687	1865	74,281	180,782	258,043
1836	.....	4,414	4,414	1866	89,703	112,830	202,533
1837	.....	5,374	5,374	1867	53,983	138,558	192,541
1838	.....	5, 90	5,190	1868	60,399	105,040	165,445
1839	.....	7,66	7,661	1869	62,266	87,135	149,401
1840	.....	35,704	35,794	1870	42,227	138,046	180,273
1841	.....	33,546	33,546	1871	135,672	137, 13	273,285
1842	.....	18,921	18,921	1872	156,976	165,31	322,287
1843 (nine months)	.....	8,545	8,645	1873	96,735	189,795	286,530
1844	.....	19,145	19,135	1874	126,669	168,977	295,646
1845	.....	17 626	17,626	1875	125,968	254,356	380,324
1846	.....	14,234	14,234	1876	95,489	236,255	331,735
1847	.....	11,220	11,220	1877	131, 16	917,937	1,049,663
1848	.....	22,466	22,466	1878	142,661	597,356	740,017
1849	.....	20,282	20,282	1879	143,457	430,848	574,305
1850	.....	34,516	34,516	1880	199,051	453,913	652,963
1851	.....	41,449	41,449	1881	220,362	409,433	629,795
1852	.....	57,240	57,240	1882	180,774	433,650	614,430
1853	.....	47,628	47,628	1883	152,192	389,371	541,553
1854	.....	88,327	88,327	1884	188,245	415,015	603,260
1855	.....	168,546	168,546				

Marble and stone, and manufactures of marble and stone, of foreign production exported from the United States, 1872 to 1884, inclusive.

Fiscal year ending June 30—	Value.	Fiscal year ending June 30—	Value.	Fiscal year ending June 30—	Value.
1872	$1,929	1877	$8,475	1881	$709
1873	4,571	1878	3,448	1882	4,848
1874	1,928	1879	6,364	1883	490
1875	3,428	1880	6,816	1884	8,420
1876	13,371				

Summarizing the foregoing statistics the movement during the fiscal years 1882, 1883, and 1884 may be stated thus:

Balance of trade in marble and stone.

Fiscal year ending June 30—	Imports.	Exports.			Excess of imports over exports.
		Of domestic productions.	Re-exports of foreign productions.	Total exports.	
1882	$828,839	$614,430	$4,844	$619,278	$209,561
1883	1,475,658	541,553	490	542,043	933,615
1884	821,389	603,260	8,420	611,680	209,709

In addition to the domestic exports tabulated there are occasional insignificant exports of roofing slate, amounting in 1871 to $1,256, and in 1881 to $1,018.

APPENDIX D.

LIST OF SOME OF THE MORE IMPORTANT STONE STRUCTURES OF THE UNITED STATES.

Locality.	Structure.	Material.	Date of erection.
Akron, Ohio	Memorial Chapel	Sandstone, Marietta, Ohio	
Albany, N. Y	State Capitol	Granite, Hallowell, Me. (in great part).	1863-'82
	City Hall	Granite, Millford, Mass	
	United States court and post-office building.	Granite, Maine	1884
Augusta, Me	State Capitol	Granite, Hallowell, Me	1829-'32
	Asylum for the Insane	do	1837-'40
	United States Arsenal	do	1828
Atlanta, Ga	United States post-office and court-house.	Granite, Vt	1880
Baltimore, Md	Eutaw Place Baptist Church	White marble (dolomite), Texas and Cockeysville, Md.	
	Brown Memorial Presbyterian Church.	do	
	Franklin Street Presbyterian Church.	do	
	City Hall	do	
	Peabody Institute	do	
	First Presbyterian Church	Sandstone, New Brunswick, N. J	
	City Prison	Gneiss, Jones's Falls, Md	
	Catholic Cathedral	Gneiss, Ellicott City, Md	1806
Bangor, Me	Post-office and custom-house	Granite, Frankfort, Me	1855
Boston, Mass	King's Chapel	Granite (bowlders)	1749-'54
	United States custom-house	Granite, Quincy, Mass	1837-'48
	United States court-house	do	1830-'31
	Masonic Temple	do	1828-'29
	St. Paul's Church	do	1820
	Merchants 'Exchange	do	1842
	Mount Vernon Church	do	
	Unitarian Church, Jamaica Plains.	do	
	Bowdoin Square Baptist Church	do	
	Bunker Hill Monument	do	1825-'42
	United States post-office	Granite, Cape Ann, Mass	1869-'82
	Boston Water-Works	do	
	St. Vincent de Paul Church	do	
	Herald Building	Granite, Concord, N. H	
	Transcript Building	do	
	Advertiser Building	do	
	Massachusetts General Hospital	Granite, Westford, Mass	1818-'21
	Massachusetts General Hospital (addition).	do	1846
	Equitable Insurance Company's building.	Granite, Hallowell, Me	
	Odd Fellows' Memorial Hall (in part).	do	
	Parker House, on School street	Marble, Rutland, Vt	1854
	St. Cloud Hotel	do	
	Hotel Dartmouth	do	
	Hotel Vendome (old part)	Marble, Italy	
	New York Mutual Life Insurance Company's building.	Marble (dolomite), Tuckahoe, N. Y.	
	Hotel Vendome (new part)	do	
	Hotel Pelham	Red sandstone, Portland, Conn., and New Jersey.	
	Second Unitarian Church	Red sandstone, Newark, N. J	
	Arlington Street Church	Red sandstone, Belleville and Little Falls, N. J	
	Young Men's Christian Union, Boylston street.	Red sandstone, Bay View, New Brunswick.	
	Young Men's Christian Union	Sandstone, Amherst, Ohio	

LIST OF SOME OF THE MORE IMPORTANT STONE STRUCTURES OF THE UNITED STATES—Continued.

Locality.	Structure.	Material.	Date of erection.
Boston, Mass	Harvard College Building, Arch street.	Sandstone, Amherst, Ohio	
	First Church, Marlborough and Berkeley streets.	Conglomerate, Roxbury, Mass	
	Brattle Square Church	do	
	Central Congregational Church	do	
	Emanuel Church, Newbury street	do	
	New Old South Church	do	
	Second Universalist Church	do	
	Tremont Street Methodist Episcopal Church.	do	
	Cathedral of the Holy Cross	do	
	St. James (Episcopal) Church	do	
	St. Peter's Church (Dorchester)	do	
	Trinity Church	Granite, Dedham, Mass	
Brooklyn, N. Y	Academy of Design, Montague street.	Brown sandstone, Portland, Conn	
Cambridge, Mass	Soldiers' Monument	Granite, Mason, N. H	
Chicago, Ill	Court-house	Dolomite, Lemont, Ill	
	do	Granite, Fox Island, Me	
		Oolitic limestone, Bedford, Ind	
	Custom-house and post-office building.	Sandstone, Freestone, Ohio	1880
	Chamber of Commerce	Granite, Fox Island and Hallowell, Me.	
	Palmer House	Sandstone, Amherst, Ohio	
	Grand Pacific Hotel	do	
	St. Paul Universalist Church	Dolomite, Lemont, Ill	
	Union League Club house	Brown sandstone, Springfield, Mass.	
	Central Music Hall	Dolomite, Lemont, Ill	
Columbia, S. C	State House	Granite, near Columbia, S. C	
	Post-office and court-house	Granite, Winnsborough, S. C	
Denver, Colo	Windsor Hotel	Rhyolite-tuff, Douglas County, Colo.	
	Union Depot	do	
	Union Pacific Freight Depot	do	
	Rio Grande Depot	do	
Hoboken, N. J	Stevens's Institute	Diabase, Jersey City, N. J	
Jersey City, N. J	Court-house	do	
	St. Patrick's Cathedral	do	
Malden, Mass	Converse Memorial Library	Sandstone, East Long Meadow, Mass.	
Middletown, Conn	Wesleyan University buildings	Brown sandstone, Portland, Conn	
Minneapolis, Minn	Washburne Flouring Mills	Magnesian limestone, Minneapolis, Minn.	
	University of Minnesota	do	
	Universalist Church	do	1873-'85
	City hall	do	
	Westminister Presbyterian Church.	Brown sandstone, Fond du Lac, Minn.	1881-'83
Mobile, Ala	Custom-House	Granite, Quincy, Mass	1858
Nashville, Tenn	do	Oolitic limestone, Bowling Green, Ky.	1882
	State capitol	Limestone near Nashville, Tenn	
Newark, N. J	Custom-house and post-office building.	Sandstone, Little Falls, N. J	1859
	County court-house	do	
New Orleans, La	Custom-house	Granite, Quincy, Mass	1872
	Monument to General Robert E. Lee.	Granite, Georgia	
		Gray marble, Knoxville, Tenn	
New York City	Columbia College	Red sandstone, Potsdam, N. Y	
	Trinity Church, Broadway and Wall street.	Brown sandstone, Little Falls, N. J.	
	Lenox Library, Fifth avenue and Seventieth street.	Limestone, Lockport, N. Y	
	Hospital, Sailors' Snug Harbor, Staten Island.	Granite, Spruce Head, Me	
	Ludlow street jail	Granite, Hallowell, Me	
	Halls of justice or "Tombs"	do	
	Seventh Regiment armory	Granite, Round Pond, Me	
	Metropolitan Museum of Art	Granite, Mt. Desert, Me	
	New York post-office	Granite, Dix Island, Me	1883
	Court-house in City Hall Park	do	
	Astor House	Granite, Quincy, Mass	
	Reformed Church, La Fayette Place.	do	
	Egyptian obelisk in Central Park	Hornblende granite, Egypt	

'ST OF SOME OF THE MORE IMPORTANT STONE STRUCTURES OF THE UNITED STATES—Continued.

Locality.	Structure.	Material,	Date of erection.
ew York City	St. Patrick's Cathedral (in part)..	Dolomite (marble). Lee, Mass.....	.....
	Old city hall, east, south, and west fronts.	Dolomite (marble), West Stockbridge, Mass.	.....
	Treasury building, Wall street ...	.....do	.....
	St. Patrick's Cathedral (in part)..	Dolomite (marble), Tuckahoe, N.Y.	.....
	Stock Exchange	.....do	.....
	St. Patrick's Cathedral (in part)..	"Snowflake" marble (dolomite), Pleasantville, N. Y.	.....
	Union Dime Savings Bank.... ..	Marble (dolomite), Pleasantville, N. Y.	.....
	Fortifications, Fort Richmond....	Granite, Dix Island, Me	.....
	Fortifications, Fort Lafayette.....	Brown sandstone, New Jersey...	.....
	Fortifications at Willets Point ...	Granite, Spruce Head, Me	.....
	Fortifications at Governor's Island.	.... do.....	.....
	Fortifications at Bedloe's Island..	.....do.....	.....
	Fortifications at Ellis Island.....	.... do.....	.....
	Fortifications, Fort Schuyler, Throgg's Neck.	Gneiss	.....
	Fortifications, Fort Wadsworth, Staten Island.	Granite, Maine.....	.....
	Fortifications, Fort Hamilton....	.....do.....	.....
	Fortifications, Fort Diamond....	.....do.....	.....
ew York City and Brooklyn.	New York and Brooklyn bridge.	Granite, Frankfort, Me.; Concord, N. H.; Spruce Head, Me.; Cape Ann, Mass.; Hurricane Island, Me.; Westerly, R. I.; East Bluehill, Me.; Stony Creek, Conn.; Mt. Desert Island, Me.; Chanceburgh, N. J.	.....
		Limestone, Rondout, N. Y.; Kingston, N. Y.; Isle La Motte, Lake Champlain; Willsborough Point, Lake Champlain; near Catskill, N. Y.	.....
iladelphia, Pa.	Girard Bank.....	Limestone (marble), Montgomery County, Pa.	1798
	United States custom-house	.....do.....	1819
	United States mint	.....do.....	1829
	United States Naval Asylum	.... do.....	1830
	Merchants' Exchange	.....do.....	1832
	Girard College.....	.....do.....	1833
	Philadelphia National Bank	Granite, Quincy, Mass	1850-'60
	First National Bank.....	.. do.....	1865
	New Masonic Temple	Granite, Fox Island, Me.; Cape Ann, Mass.	1872
	New Post-Office	Granite, Dix Island, Me.; Richmond, Va.	1883
	St. Mark's Protestant Episcopal Church.	Sandstone, Portland, Conn.....	1849
	Bank of Commerce	.....do.....	1850
	Bank of North America	.....do.....	1850
	Holy Trinity Episcopal Church ..	.....do.....	1857
	Fifth Baptist Church.....	do.....	1863
	New city buildings	Dolomite (marble), Lee Mass.....	.....
	University of Pennsylvania	Serpentine, Chester County, Pa...	1871
	Memorial Baptist Church.....	.....do.....	1874
	Holy Communion Church	.....do.....	1875
	Academy of Natural Sciences	.....do.....	1876
	Young Men's Christian Association.	Sandstone, Ohio.....	1868
ortland, Me	Forts Preble, Scammel, and Gorges	Granite, Mount Waldo, Biddeford, and Spruce Head, Me.	.....
	Post-office	Crystalline limestone (marble), Vermont.	1872
	Custom-house.....	Granite, Hallowell, Me., Concord, N. H.	1872
rovidence, R. I....	City hall	Granite, Hurricane Island, Me.; Westerly, R. I., and Concord, N. H.	.....
	Soldiers' and sailors' monument ..	Granite, Westerly, R. I.....	.....
	Post-office and custom-house.....	Granite, Quincy, Mass.....	1858
	Roger Williams's monument.....	Granite, Westerly, R. I	.....
	New Catholic cathedral.....	Sandstone, Portland, Conn.....	.....
	Grace Church.....	Sandstone, Little Falls, N. J.....	.....
	First Congregational Church	Granite, Smithfield, R. I	.....

LIST OF SOME OF THE MORE IMPORTANT STONE STRUCTURES OF THE UNITED STATES—Continued.

Locality.	Structure.	Material.	Date of erection.
Saint Paul, Minn.....	Catholic cathedral	Magnesian limestone, Saint Paul, Minn.	.....
	Unitarian church.....	.....do.....	.....
	St. Paul's Episcopal church.....	Magnesian limestone, Kasota, Minn.	1873-'74
	United States custom-house and post-office.	.....do.....	1872
	Adams school.....	.....do.....	.....
	Franklin school.....	.....do.....	.....
	County jail	.....do.....	.....
Salt Lake City, Utah.	Assembly house	Granite, Little Cottonwood Cañon, Utah.	.....
	New Mormon Temple.....	.....do.....	.....
San Francisco, Cal...	Bank of California.....	Blue sandstone, Angel Island, San Francisco Bay.	1865
	United States mint	Sandstone, New Castle Island, Gulf of Georgia, British Columbia.	1874 .....
Savannah, Ga.....	Presbyterian church.....	Granite, Quincy, Mass.....	.....
	Custom-house	.....do.....	1852
Trenton, N. J	State capitol	Sandstone, Trenton, N. J.	.....
	State prison	.....do	.....
Washington, D. C ...	Executive Mansion	Sandstone, Acquia Creek	.....
	Treasury Building, old portion...	.....do.....	1836 '41
	Treasury Building, new portion...	Granite, Dix Island, Maine	1855
	Patent Office Building, old portion.	Sandstone, Acquia Creek, Va	1837-'42
	Patent Office Building, extension	Dolomite (marble), Cockeysville, Md.	1849-'64
	Chapel in Oak Hill Cemetery....	Mica schist, near Washington ..	.....
	Georgetown College (new building.)	.....do.....	.....
	Cabin John's Bridge, parapets and coping.	Sandstone, Seneca Creek, Md....	1848-'55
	Washington Monument, exterior, in part.	Dolomite (marble), Lee, Mass..	1848-'84
	Washington Monument, exterior.	Dolomite (marble), Cockeysville, Md.	.....
	Washington Monument, interior..	Mica schist, near Washington; granite, Massachusetts and Maine.	.....
	General Post-Office, old portion ..	Dolomite (marble), West Chester, N. Y.	1839
	General Post-Office, extension ...	Dolomite (marble), Cockeysville, Md.	1855
	United States Capitol, old portion.	Sandstone, Acquia Creek	1793
	United States Capitol, extension..	Dolomite (marble), Lee, Mass ..	1851-'65
	United States Capitol, extension, columns.	Dolomite (marble), Cockeysville, Md.	.....
	Smithsonian Institution	Sandstone, Seneca Creek, Md	1847-'56
	St. Dominick's Church	Gneiss, Port Deposit, Md	.....
	Corcoran Art Gallery (in part) ...	Sandstone, Belleville, N. J	.....
	State, War, and Navy Building.	Basement and sub-basement granite, Maine; superstructure granite, near Richmond, Va.	1871-'86
	Butler house, Capitol Hill.....	Granite, Cape Ann, Mass	.....

APPENDIX E.

BIBLIOGRAPHY OF WORKS ON BUILDING STONE.

The following list includes all the principal works on the subject of building stone which have come under the writer's notice. It does not include isolated and special papers which have appeared from time to time in various journals and periodicals, or State geological reports. Such, when containing matter of sufficient importance, have been mentioned in the text and reference given in the foot-notes. The list is arranged alphabetically by authors.

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APPENDIX F.

GLOSSARY OF TERMS.

Æolian rocks. Fragmental rocks composed of wind-drifted materials. The "drift sand rock," the common building stone of Bermuda, is a good example.

Argillaceous. Containing clayey matter.

Ashlar masonry. Cut stone laid in continuous courses.

Bardiglio. This is a favorite Italian marble obtained on Montalto, on the southern borders of Tuscany. It is a gray or bluish color, traversed by dark veins. In some specimens the veining assumes the appearance of flowers, when it is known as Bardiglio fiorito. The name is now commonly applied to any marble having this color and veining.

Bastard granite. A somewhat indefinite name given by quarrymen to gneissic or schistose rocks, resembling granites in a general way, but differing in structure. The name is frequently applied by quarrymen to any vein or dike rock occurring in a granite quarry.

Bird's-eye-marble. A term used in Iowa to designate a fossil coral (Acervularia davidsonia), and used for making small ornaments.

Bituminous. Containing bitumen.

Breast. The face or wall of a quarry is sometimes called by this name.

Breccias. Fragmental stones, the individual particles of which are large and angular in form.

Bluestone. In Maryland a gray gneiss; in Ohio a gray sandstone; in the District of Columbia a mica schist; in New York a blue-gray sandstone; in Pennsylvania a blue-gray sandstone. A popular term; not sufficiently definite to be of value.

Butt. The butt of a slate quarry is where the overlying rock comes in contact with an inclined stratum of slate rock.

Calcareous. Containing lime.

Cavernous. Containing irregular cavities or pores, due in most cases to the removal of some mineral, or in limestones of a fossil.

Cellular or vesicular. Containing cells or vesicles. This structure is very common in recent eruptive rocks, especially the glassy forms. Sometimes the stone contains so many cells that it will float on water, as is the case with common pumice. These cells are in many cases subsequently filled with other minerals, and the rock is then called amygdaloidal. The Brighton melaphyr is the best example of amygdaloidal structure found in our building stones.

Choncoidal fracture. When the surfaces of a chip broken off by a hammer are curved like a bivalve mollusk the stone is said to have a choncoidal fracture. Compact stones, like lithographic limestones, obsidians, and flints, usually break in this manner.

Clayholes. Cavities in stones which are usually filled with fine sand or clayey material often of a lighter color than the stone itself and so loosely coherent as to fall away immediately or to weather out on exposure. They are especially prevalent in many of our Triassic sandstones, and, besides being unsightly, are elements of weakness and should always be avoided.

Concretionary. Made of concretions, or rounded particles formed by the collecting of mineral matter around some center so as to form a rounded mass composed of concentric layers like the coatings of an onion. When the concretions are small, like the roe of a fish, the structure is called *oölitic*, or if large as a pea, *pisolitic*. The best examples of this structure in our building stones are the oölitic limestones of Bedford, Ind., and other places. A rare structure in crystalline rocks.

Conglomerates. Fragmental stones composed of large, rounded fragments.

Coquina. The Spanish name for a shell limestone which occurs abundantly in Florida, composed simply of a mass of shells connected together.

Coral limestone. A rock composed of fragments of corals.

Crystalline. Consisting wholly of crystals or crystalline particles, *not fragmental*. Rocks which like granite or crystalline limestone are made up wholly of crystalline grains are called *crystalline-granular* or *granular-crystalline* rocks. The terms *micro-crystalline* and *crypto-crystalline* are often applied to rocks in which the individual particles are too small to be readily distinguished by the unaided eye. Such rocks are sometimes called *compact*, a term which is also applied to fragmental rocks of similar texture.

Curb. A flat piece of stone placed vertically, bounding the street edges of sidewalks, etc.

Diabase. An eruptive rock composed essentially of a plagioclase feldspar and augite.

Dikes (or **dykes**). Masses of volcanic rock which have been forced up from below in a molten condition to fill fractures or fissures in the earth's crust. Such are also called trap-rocks. The diabases and a variety of eruptive rocks frequently occur in the form of dikes.

Diorite. An eruptive rock composed essentially of a plagioclase, feldspar, and hornblende.

Dip. The slope or pitch of the strata, or the angle which the layers make with the plane of the horizon.

Dolomite. A stone composed of mixed calcium and magnesium carbonates.

A "Dry." A natural seam usually invisible when the rock is freshly quarried, but which is brought out on exposure to weather or sometimes during the process or cutting. A very serious defect in many stones.

Escarpment. A nearly vertical natural face of rock or ledge.

Feldspathic. Containing feldspar.

Ferruginous. Containing iron oxides.

Fibrous. Having a structure as though made up of bundles of distinct fibers. This structure is not found in any building stone, but is common in some forms of gypsum and of calcite, which are used for making small ornaments.

Flagstone. Any kind of a stone which separates naturally into thin tabular plates suitable for pavements and curbing. Especially applicable to sandstones and schists.

Flint. Quartz in any kind of rock is commonly known to quarrymen as flint. True flint is amorphous silica, occurring in nodular form in chalk beds.

Foliated or schistose. Terms applied to rocks which, like gneiss and schist, have their constituents arranged in more or less definite nearly parallel planes.

Fragmental or clastic. Terms which are applied to rocks composed of fragments, like ordinary sandstone. When the fragments are the size of a pea or larger, and rounded in form, the structure is called *conglomerated*, or if the particles are angular, *brecciated*.

Freestone. This is a term which has been applied to stones that work freely in any direction. Especially applied to sandstones and limestones. A term of no special value, as it is too indefinite.

Gneiss. A rock of the composition of granite but in which the ingredients are arranged in more or less parallel layers.

Gneissoid. Like gneiss.

Grain. The direction in a rock at right angles with the rift.

Granite. A rock consisting of quartz, orthoclase, and mica or other accessory minerals. In the stone-cutter's nomenclature no distinction is made between the varieties; all stones which are hard, granular, and crystallized are called granite.

Granitoid. Thoroughly crystalline and massive, like granite.

Granular. A term applied to rocks composed of distinct grains, whether fragmental and water worn or crystalline.

Greenstone or **grünstein.** A term formerly used to designate certain basic eruptive rocks occurring in the form of dikes. Through mistaken notions regarding their true nature and from a general similarity in their appearance the name was made to include a variety of compact, dark-greenish or nearly black rocks, which microscopic examination has shown to be principally diabase and diorite.

Grit. Any sharp, gritty sandstone or schist used as a whetstone or hone.

Grub-saw. A saw made from a notched blade of thin iron, and provided with a wooden back. Used with sand for sawing stone by hand-power. (See Plate v.)

Guys. Ropes or chains used to prevent anything from swinging or moving about.

Hackly fracture. A term applied when the surfaces of a fracture are rough and jagged.

Joints. Divisional planes which divide the rock in the quarry into natural blocks. There are usually two or three nearly parallel series called by quarrymen end joints, back joints, and bottom joints, according to their position. (See section F.)

Ledge. Any natural solid body of rock.

Lewis hole. The Lewis* hole consists of a series of two or more holes drilled as closely together as possible, and then connected by knocking out the thin partition between them, forming thus one wide hole, having its greatest diameter in a plane with the desired rift. Blasts from such holes are wedge-like in their action, and by means of them larger and better-shaped blocks can be taken out than would otherwise be possible. This style of hole is said† to have been devised by a Mr. Joseph Richards, of Quincy, though at about what date we are not informed. This same gentleman was also the inventor of the bush hammer, which, however, when first patented, about 1831, consisted of a solid piece, instead of several pieces bolted together as now.

Limestone. Under this term almost all the calcareous quarried rocks, whether fragmental or crystalline, are classified.

Liver rock. This term is applied to that variety of the Ohio sandstone which breaks or cuts as readily in one direction as in another. In other words, the working of the stone is not affected by stratification.

Lyonaise marble. A local term applied to marbles which are composed of a mixture of red and white colors, as those of Mallet's Bay, Vt.

Marble. Any limestone or dolomite capable of being polished and suited for ornamental work.

Massive; unstratified. Having, no definite arrangement in layers or strata, but the various ingredients being thoroughly commingled, as in granite and diabase.

Nigger head. (1) The black concretionary nodules found in granite;

(2) Any hard, dark, colored rock weathering out into rounded nodules or bowlders;

(3) Slaty rock associated with sandstone. A quarryman's term.

Oolite. A stone composed of small globules resembling the roe of a fish.

Ophiocalcite. A mixture of serpentine and limestone.

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*This word is spelled by some Louis.

†Potter's History of Quincy, Mass.

Orbitoides limestone. A fossiliferous limestone abundant in the upper Eocene formation in the Southern States.

Perch. In Philadelphia, 22 cubic feet are called a perch. A perch of masonry contains 24¾ cubic feet, 16½ x 1½ x 1. It is usually taken at 25 cubic feet. The term is falling into disuse.

Plucky. A term often used by stone-cutters to designate stones which under the chisel break away in irregularly conchoidal chips, and which are therefore difficult to trim to a line or to bring to a perfect surface. Common in compact and impure limestones.

Porphyry. Any stone composed of an extremely fine groundmass in which larger crystals are developed.

Porphyritic. When a rock consists of a compact or fine and evenly crystalline groundmass, throughout which are scattered larger crystals, usually of feldspar, the structure is said to be porphyritic. This structure is quite common in granite, but is not particularly noticeable, owing to the slight contrast in color between the larger crystals and the finer groundmass. It is most noticeable in such rocks as the felsites, in which, as is the case with some of the "porphyries" of eastern Massachusetts, the groundmass is exceedingly dense and compact and of a black or red color, while the large feldspar crystals are white and stand out in very marked contrast. This structure is so striking in appearance that rocks possessing it in any marked degree are popularly called porphyries whatever may be their mineral composition. The term porphyry is said to have been originally applied to certain kinds of igneous rocks of a reddish or purple color, such as the celebrated red porphyry or "rosco antico" of Egypt. The word is now used by the best authorities almost wholly in its adjective sense, since any rock may possess this structure whatever its origin or composition may be.*

Putty powder, or polishing putty, is a fine whitish powder, consisting in the commercial form of about equal parts oxide of tin and lead. Used in polishing stone and glass.

Quarry. Any opening in a ledge for taking out stone.

Quarry water. All rocks when first taken from the quarry contain more or less water, which evaporates on exposure, leaving the stone considerably harder. In sandstones this quarry water is considered by Newberry to be a solution of silica (Rep. of Judges, Group 1, p. 127). Its composition probably varies greatly in different classes of rocks. (See p. 339.)

Rhyolite. A post-Tertiary volcanic rock of the composition of granite.

Rift. The direction in a rock parallel to the lamination or foliation, and along which it splits with greatest ease.

Rubberstone. A sharp-gritted Ohio or Indiana sandstone used for sharpening shoe-knives; also called a shoe-stone.

Rubble masonry. Rough, unsquared stones laid in irregular courses.

Saccharoidal. Having a grain and structure like that of loaf sugar. Common in crystalline limestone.

Salt veins. A term applied by the quarrymen to the coarse granite veins from 2 inches to 2 or more feet thick, and which are found intersecting granites and older crystalline rocks.

Scab. A local term used in certain sandstone quarries in Iowa. The stone is very massive and is broken from the quarry in irregular lumps by blasting. These lumps are then trimmed down to a shape approximately rectangular by means of heavy picks. This process is denominated *scabbing*.

Sap. The term originated from imagined analogy between the decomposed layer and the sap wood of trees. A term applied to the stained and worthless portions of the stone extending inward from the point.

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* Hull, Building and Ornamental Stones, p. 75.

Sculp. To sculp slates is to break up the large blocks into long slabs, suitable to split.

Segregated. A term applied to the veins and nodular masses of finer or coarser texture that have formed in granite and other crystalline rocks; as for example, the black patches in granite.

Serpentine. A rock composed of hydrous magnesia silicate.

Shell limestone. Rock composed of consolidated shells.

Siliceous. Containing silica.

Spalls. This is a term which is used quite generally by stone-cutters to denote the chips and other waste material cut from a block in process of dressing.

Spider-web. A term applied to the wavy lines in the Ohio sandstones, and which are caused by stains of iron oxide. Frequently seen in sawed stones, especially where the lamination is slightly oblique or irregular. It is very like the grain of wood which shows in a planed board.

Split rock. This term applies to those rocks possessing tabular structure, or which cleave easily in the lines of lamination, and are consequently applicable to the preparation of flagging and for curbstones.

Stalactitic marble. This is a marble which is formed by the deposit of lime carbonates from waters percolating into cavities or caves.

Strata. Layers or beds of rock of the same kind lying one upon another.

Stratified; bedded. Composed of layers or beds lying parallel to one another, as is so frequently seen in sandstone and limestone. When the strata are fine and leaf-like the structure is called laminated or shaly.

Streaked. Having some of the mineral constituents so arranged as to give the rock a striped or streaked appearance. In the eruptive rocks this structure is often produced by the flowing of the mass in a partially cooled condition. It is best seen in obsidian, rhyolite, and quartz porphyries.

Stock. The useful rock taken from a quarry.

Strike. The direction in strata at right angles to the dip, or the course of a horizontal line on the surface of inclined beds.

Syenite. A granular massive rock with the structure of a granite, but containing no quartz.

Trachyte. A post-Tertiary volcanic rock of the composition of syenite.

Trap or trap rock. (See Dikes and Greenstone.) The name applies to the manner in which a rock occurs, and is not itself a name of specific value.

Travertine. A calcareous rock deposited by water from solution, and which was used as a building stone in Rome. (See text.)

Verde antique. Antique green. A rock composed of a mixture of serpentine and limestone.

Vitreous or glassy. These terms are applied to rocks that have a structure like glass, as obsidian. Rocks of this type are at present little used for any kind of work.

APPENDIX G.

CATALOGUE OF THE COLLECTION OF BUILDING AND ORNAMENTAL STONES IN THE U. S. NATIONAL MUSEUM.

I. UNITED STATES AND TERRITORIES.

ALABAMA.

Limestone. Fine; dark drab. Calera, Shelby County. Calera Lime Works. Centennial, 1876. 17481.

—— Fossiliferous; semi-crystalline; very light drab. Near Florence, Lauderdale County. Douglass quarries. Maj. W. R. King, U. S. Army. 27328.

—— Fossiliferous; semi-crystalline; light drab. Near Florence, Lauderdale County. Harkin's quarry. Maj. W. R. King, U. S. Army. 27327.

—— Coarse; porous; light buff. Turk's Cave. U. S. Geological Survey, 1884. 35782.

—— Oolitic; fine; light colored. Near Dickson, Colbert County. Quarries of T. L. Fossick & Co. Tenth Census, 1880; 2 specimens. 26759.

—— Fine; light brown; fossiliferous. Near Tuscumbia, Colbert County. Bowser's quarry. Maj. W. R. King, U. S. Army. 27325.

—— Oolitic; semi-crystalline; drab. Trinity, Lawrence County. Trinity quarry. Maj. W. R. King, U. S. Army. 27329.

—— Fossiliferous; semi-crystalline; light colored. Near Leighton, Lawrence County. Walker's quarry. Maj. W. R. King, U. S. Army. 27326.

Limestone [marble]. White; crystalline. About 4 by 4 by 2 inches. Talladega County. Centennial, 1876. 17482.

—— Pure white; crystalline. 5¾ by 4 by 1 inches. Talladega, Talladega County. A. W. Bowie's quarry. Tenth Census, 1880. 27314.

Sandstone. Dark yellow; coarse; porous. De Kalb County. Collinsville quarry. Tenth Census. 25918.

—— Gray; fine and compact; with pyrite. Near Greensport, St. Clair County. Gibson's quarry. Tenth Census. 27330.

ARIZONA.

Limestone. Fine; light buff. Near Albuquerque, Yavapai County. John S. F. Batchen, 1884. 35745.

Sandstone. Deep pink; fine and compact. Yavapai County. Chino quarry. John S. F. Batchen. 35571.

—— Light colored; fine grained. Yavapai County. Cañon Diablo quarry. John S. F. Batchen. 35744.

ARKANSAS.

Elæolite syenite. Very coarse. Large block, 5 feet square by 12 inches thick; one face polished, and with carved inscription, "Specimen from the Diamond Jo Granite Co., Hot Springs, Arkansas." Hot Springs. Diamond Jo quarry. John S. F. Batchen, 1883. 28599.

Elæolite syenite. Fine; greenish gray. Hot Springs. Diamond Jo quarry. John S. F. Batchen, 1883. 27519.

Limestone. Oolitic; fine; dark drab. Blansett, Scott County. Tenth Census, 1880. 26643.

—— Quartzite; light colored; fine and compact. Bald Knob, White County. Bald Knob quarry. Tenth Census. 26524.

CALIFORNIA.

Steatite [soapstone]. Fine; compact; blue gray. A. P. Blake. 25014.

Marble. White; yellow veined. 5½ by 5½ by ¾ inches. Kern County. Tenth Census, 1880. 25469.

Limestone [marble]. White; green mottled. Two small slabs. Near Auburn, Placer County. Robert E. C. Stearns, 1883. 27352.

—— White, and white with dark veins; crystalline. Two specimens. Indian Diggings, El Dorado County. Tenth Census, 1880. 25451.

Magnesian limestone [marble]. Dark gray; compact. Colfax, Placer County. Colfax quarry. Tenth Census, 1880. 25636.

Stalagmite [marble]. Pinkish. 4 by 3½ by 1 inches. Mrs. J. L. Wilkins, 1882. 27301.

Travertine [marble]. Massive; white; translucent. Three small pieces. Popularly called California onyx. San Luis Obispo. Chas. E. Hall & Co., 1884. 36758.

—— White; translucent. About 3½ inches. San Luis Obispo. John Dimond, New York, 1884. 36759.

—— Massive; white; translucent. Two specimens. Near San Luis Obispo, San Luis Obispo County. San Luis Obispo quarry. Tenth Census, 1880. 25571.

—— Light green. 11 by 5 by 1 inches. Sacramento River, near Crescent Falls, near Berryvale, Siskiyou County. J. S. Diller, 1884. 36886.

—— Emerald green; fine and compact. About 3 by 3 by 1¾ inches. Falls of Sacramento River, Siskiyou County. Chas. H. Townsend, 1881. 35746.

—— Reddish brown. 10 by 5 by 1 inches. Suisun City, Solano County. Centennial, 1876. 25255.

—— Brown. About 10 by 7½ by 1 inches. Suisun City, Solano County. Centennial, 1876. 25256.

—— Brown; mottled. About 7½ by 5 by ¾ inches. Suisun City, Solano County. Centennial, 1876. 16054.

—— Brown and amber yellow. 5 pieces irregular shaped. Suisun City, Solano County. B. K. Emerson, 1886. 38445.

Biotite granite. Medium; light gray. Rocklin, Placer County. G. Griffith's quarry. Tenth Census, 1880. 25539.

Hornblende biotite granite. Coarse; gray. Penryn, Placer County. G. Griffith's quarry. Tenth Census, 1880. 25542.

Hornblende granite (?). Medium; very dark gray, nearly black. Penryn, Placer County. G. Griffith's quarry. Tenth Census, 1880. 25554.

The abundance of plagioclase feldspar and small amount of orthoclas in this rock place it intermediate between true granite and quartz diorite.

Basalt. Compact; dark gray. Bridgeport, Solano County. Used only for street pavement. Thomason's quarry. Tenth Census, 1880. 25663.

—— Compact; dark gray. Near Petaluma, Sonoma County. Used only for street pavement. Quarry of J. Codden Bros. and others. Tenth Census, 1880. 25664.

Sandstone. Coarse; light brown. Near Alameda, Alameda County. Tenth Census. 25569.

—— Fine; gray. Angel Island, Marin County. Angel Island quarry. Tenth Census. 25570.

—— Fine; gray. Livermore, Alameda County. Livermore qnarry. Tenth Census. 25665.

—— Brown. Haywards, Alameda County. Excelsior quarry. Tenth Census. 25801.

—— Coarse; very light buff. Near San José, Santa Clara County. Goodrich quarry. Tenth Census. 25797.

—— Coarse ; very light buff. Near San José, Santa Clara County. Goodrich quarry Tenth Census. 25798.

—— Coarse; very light gray. Near San José, Santa Clara County. Goodrich quarry. Tenth Census. 25799.

Andesite tuff. Coarse; gray. Near Cordelia, Solano County. Thomason's quarry. Tenth Census, 1880. 25800.

COLORADO.

Limestone. Fine; black. Pitkin, Gunnison County. Sunnyside quarry. J. S. F. Batchen, 1884. 35990.

—— Fine; dark, mottled. Pitkin, Gunnison County. J. S. F. Batchen, 1884. 36011.

—— Coarse; pink. Morrison, Jefferson County. Morrison quarry. J. S. F. Batchen, 1884. 35995.

—— Semi-crystalline; dull ; pink mottled. Near Morrison, Jefferson County. Morrison quarry. J. S. F. Batchen, 1884. 35996.

Biotite granite. Medium; gray; indistinctly porphyritic. Lawson, Clear Creek County. Quarry of Commet and Ivers. J. S. F. Batchen, 1884. 35980.

—— Medium; gray. Georgetown, Clear Creek County. J. S. F. Batchen, 1884. 35987.

—— Coarse; light red. Platte Cañon, Jefferson and Douglas Counties. Government quarries. Tenth Census, 1880. 25784.

Muscovite gneiss. Medium; light gray. Lawson, Clear Creek County. Quarry of Commet and Ivers. J. S. F. Batchen, 1884. 35981.

Diorite. Fine; light greenish gray. Monarch, Chaffee County. H. H. Church's quarry. J. S. F. Batchen, 1884. 36004.

Sandstone. Light drab, laminated with blue gray. Fort Collins, Larimer County. Fort Collins quarry. Tenth Census. 25783.

—— Fine; light colored. Fort Collins, Larimer County. Fort Collins quarry. Tenth Census. 25787.

—— Light colored; fine and compact. Near Fort Collins, Larimer County. E. B. Yout's quarry. Tenth Census. 27005.

—— Fine; light red. Near Fort Collins, Larimer County. La Porte quarry. Tenth Census. 27023.

—— Nearly quartzite; light pink; fine and compact. Longwort, Larimer County. Longwort quarry. John S. F. Batchen. 35997.

—— Light red; laminated. Greeley, Larimer County. John S. F. Batchen. 36001.

—— Nearly quartzite; light colored; fine and compact. Buckhorn, Larimer County. C. J. McWhorter's quarry. John S. F. Batchen. 36839.

—— Fine; light colored. Coal Creek, Fremont County. Coal Creek quarry. Tenth Census. 25789.

—— Fine; light colored. Arkansas River, Fremont County. Braudford quarry. Tenth Census. 25891.

Sandstone. Fine; olive-tinted. Near Cañon City, Fremont County. Quarry of Blodety & Nutts. Tenth Census, 25785.

—— Fine; light colored. Near Cañon City, Fremont County. Quarry of Frank & Lutz. John S. F. Batchen. 35983.

—— Triassic; light red; micaceous. Sec. 3, T. 4, R. 70 W., Jefferson County. Welch quarry. Tenth Census. 26858.

—— Triassic; fine; light brown. Golden, Jefferson County. Centennial, 1876. 27124.

—— Light gray; fine; micaceous. Trinidad, Las Animas County. Trinidad quarry. Tenth Census. 25788.

Quartzite. Nearly white; very fine and compact. Pitkin, Gunnison County. Quarry of Huck & Co. John S. F. Batchen, 1881. 33338.

Rhyolite tuff. Light pink. Used for general building in Denver. Douglas, Douglas County. Colorado Manufacturing Company. Tenth Census, 1880. 27360.

—— Light colored; fine; vesicular. Used for general building in Denver. Near Castle Rock, Douglas County. G. F. Girardot's quarry. Tenth Census, 1880. 25786.

CONNECTICUT.

Dolomite [marble]. White and bluish; crystalline. Two specimens. East Canaan, Litchfield County. E. P. Allen's quarry. Tenth Census, 1880. 26435.

—— White; crystalline. East Canaan, Litchfield County. A. Maxwell's quarry. Centennial, 1876. 17544.

—— White; crystalline. East Canaan, Litchfield County. Centennial, 1876. 17545.

—— White; crystalline. East Canaan, Litchfield County. Centennial, 1876. 17546.

—— White, dark mottled; crystalline. East Canaan, Litchfield County. Centennial, 1876. 17561.

—— White; crystalline. About 12 by 12 by 8 inches. East Canaan, Litchfield County. Centennial, 1876. 17562.

—— White; crystalline. Falls Village, Litchfield County. Mathby's quarry. Tenth Census, 1880. 26169.

Biotite granite. Fine; very light gray. West Norfolk, Litchfield County. Centennial, 1876. 17535.

—— Fine; gray. West Norfolk, Litchfield County. Centennial, 1876. 17537.

—— Fine; gray. West Norfolk, Litchfield County. Centennial, 1876. 17538.

—— Fine; gray. West Norfolk, Litchfield County. Centennial, 1876. 17558.

—— Fine; gray. West Norfolk, Litchfield County. Quarry of Snow & Wooster. Tenth Census, 1880. 26416.

—— Coarse; porphyritic; pink and gray mottled. Foot cube. Leete's Island, New Haven County. Centennial, 1876. 25262.

—— Medium; pink. 6 inch cube. Leete's Island, New Haven County. Centennial, 1876. 25577.

—— Medium; pink. 6 inch cube. Leete's Island, New Haven County. J. Beattie's quarry. Tenth Census, 1880. 25456.

—— Fine; light pinkish gray. Foot cube. Leete's Island, New Haven County. Centennial, 1876. 17530.

—— Coarse; pinkish gray. Foot cube. Leete's Island, New Haven County. Centennial, 1876. 17525.

—— Medium; gray. Foot cube. Branford, New Haven County. Centennial, 1876. 17532.

Biotite granite. Coarse; pink. Foot cube. Stony Creek, New Haven County. Centennial, 1876. 17521.

—— Coarse; pink. East bank of Stony Creek, New Haven County. J. Robbin's quarry. Tenth Census, 1880. 25947.

—— Fine; gray. Groton, opposite New London, New London County. Quarry of Merritt, Gray & Co. Tenth Census, 1880. 25485.

—— Very coarse; red. Lyme Station, New London County. Quarry of C. J. McCurdy & E. E. Salisbury. Tenth Census, 1880. 26079.

—— Fine; gray. Foot cube. Millstone Point, New London County. Centennial, 1876. 17527.

—— Fine; light gray. Foot cube. Mystic Bridge, New London County. Centennial, 1876. 17520.

—— Fine; gray. Waterford, New London County. Quarry of J. B. Palmer & Co. Tenth Census, 1880. 25425.

—— Medium; gray. Foot cube. Norwalk, Fairfield County. Umpewang quarry. Centennial, 1876. 17522.

—— Medium; gray. Branchville, Fairfield County. Umpewang quarry. Tenth Census, 1880. 26337.

—— Fine; gray. Millstone Point, Niantic, New London County. Centennial, 1876. 17540.

—— Fine; light gray. Foot cube. Thomaston, Litchfield County. Centennial, 1876. 17529.

Muscovite biotite granite. Fine; light gray. Foot cube. Thomaston, Litchfield County. Centennial, 1876. 17523.

—— Fine; light gray. Foot cube. Reynolds Bridge, Litchfield County. Centennial, 1876. 17524.

Biotite muscovite granite. Fine; light gray. Near Thomaston Station, Litchfield County. Plymouth Granite Company. Tenth Census, 1880. 26298.

Biotite muscovite gneiss. Fine; light gray. Roxbury, Litchfield County. E. Mower's quarry. Tenth Census, 1880. 26624.

Muscovite biotite gneiss. Fine; light gray. Foot cube. Roxbury Station, Litchfield County. Centennial, 1876. 17531.

—— Fine; light gray. Foot cube. Ansonia, New Haven County. Centennial, 1876. 17523.

—— Fine; light gray. Ansonia, New Haven County. Quarry of Spring & Willcox. Tenth Census, 1880. 26195.

Biotite gneiss. Medium; gray. East Canaan, Litchfield County. Centennial, 1876. 17564.

—— Fine; gray. Near Branford, New Haven County. C. D. Allen's quarry. Tenth Census, 1880. 25618.

—— Fine; dark gray; porphyritic. Foot cube. Milford, New Haven County. Centennial, 1876. 17533.

—— Coarse; light gray. Near Lyme Station, New London County. Quarry of Luce & Hoskins. Tenth Census, 1880. 25451.

—— Medium; gray. Sterling, Windham County. J. W. Boswell's quarry. Tenth Census, 1880. 26388.

—— Coarse; gray. Sterling, near Hartford, Windham County. Quarry of Oneco Ledge Company. Tenth Census, 1880. 25484.

—— Coarse; pinkish gray. East Killingly, Windham County. J. Oatley's quarry. Tenth Census, 1880. 26299.

Biotite gneiss. Coarse; gray. Stafford Springs, Tolland County. Truesdell quarry. Tenth Census, 1880. 26277.

—— Fine; gray. East Glastonbury, Hartford County. C. Hentz's quarry. Tenth Census, 1880. 26415.

Hornblende biotite gneiss. Fine; dark gray. Middletown, Middlesex County. Centennial, 1876. 17541.

—— Fine; dark gray. Haddam, Middlesex County. I. Arnold's quarry. Tenth Census, 1880. 26327.

—— Medium; dark gray. Greenwich, Fairfield County. T. Ritch's quarry. Tenth Census, 1880. 26338.

—— Medium; dark gray. Greenwich, Fairfield County. William Rich's quarry. Tenth Census, 1880. 26339.

—— Coarse; dark gray. North Bridgeport, Fairfield County. W. Beer's quarry. Tenth Census, 1880. 26649.

Granite. Turned column of coarse pink porphyritic granite. 16 inches high and 6 inches in diameter. Leete's Island, New Haven County. Centennial, 1876. 17566.

Diabase. Mesozoic; fine and compact; dark gray; nearly black on a polished surface. Used chiefly for street pavements. West Rock, New Haven County. C. W. Blakeslee's quarry. Tenth Census, 1880. 25912.

Sandstone. Triassic; brown; medium. 12-inch cube. Portland, Middlesex County. Shaler & Hall Quarry Company. Centennial, 1876. 17534.

—— Triassic; coarse; brown. Portland, Middlesex County. 17536.

—— Triassic; medium; brown. Portland, Middlesex County. Middlesex quarry. Centennial, 1876. 17557.

—— Triassic; medium; brown. Portland, Middlesex County. Middlesex Quarry Company. Tenth Census. 25424.

—— Triassic; fine; brown. Portland, Middlesex County. Quarry of Shaler & Hall. Tenth Census. 25483.

—— Triassic; fine; brown. Portland, Middlesex County. Quarry of Brainard & Co. Tenth Census. 26077.

—— Triassic; medium; red. Manchester, Hartford County. C. O. Wolcott's quarry. Tenth Census. 26129.

—— Triassic; fine; red. Manchester, Hartford County. C. O. Wolcott's quarry. Tenth Census. 26429.

—— Triassic; coarse; reddish gray. East Haven, New Haven County. Robert Redfield. Tenth Census. 26453.

DAKOTA.

Quartzite. Potsdam; reddish brown; fine and compact; used for general building, tiling, and ornamental work. Sioux Falls, Minnehaha County. Tenth Census. 26662.

—— Potsdam; light red; fine and compact; used for general building, tiling, and ornamental work. Sioux Falls, Minnehaha County. J. L. Phelps's quarry. Tenth Census. 26663.

DELAWARE.

Augite hornblende gneiss. Fine; dark gray. Near Wilmington, New Castle County. P. P. Tyre's quarry. Tenth Census, 1880. 25401.

Dolomite [marble]. Lower Silurian; white; crystalline. Hockessin, New Castle County. Jackson Lime and Marble Company. Tenth Census, 1880. 25402.

DISTRICT OF COLUMBIA.

Steatite [soapstone]. Fine; compact; light blue gray. On land of W. W. Evans, north of Woodley Lane road, Washington. Dr. William S. McIlhenney, 1886. 38510.

FLORIDA.

Limestone. Oolitic; porous and friable; nearly white. Key West. New Orleans Exposition, 1885. 37631.

—— Coarse shell rock ("coquina"); light colored. Suwannee River. John S. F. Batchen, 1884. 35898.

Sandstone. Phosphatic; light colored; coarsely cellular. Near Hawthorne, Alachua County. C. A. Simmons's quarry. Tenth Census. 25208.

—— Phosphatic; nearly white; coarsely vesicular. Suwannee River. John S. F. Batchen, 1884. 35899.

GEORGIA.

Limestone [marble]. Lower Silurian; pink; coarse; crystalline. Tate, Pickens County. Georgia Marble Company, 1886. 38367.

—— Lower Silurian; white with dark blotches; coarse; crystalline. Two specimens. Tate, Pickens County. Georgia Marble Company, 1886. 38368.

—— Lower Silurian; pure white; coarse; crystalline. Turned column, 6 inches long, 1 inch diameter. Tate, Pickens County. Georgia Marble Company, 1886. 38370.

—— Lower Silurian; white and dark mottled; coarse; crystalline. Tate, Pickens County. Georgia Marble Company, 1886. 38369.

Dolomite [marble]. Purplish gray; fine and compact. Near Chattanooga, Catoosa County. Chickamaugua quarry. Tenth Census, 1880. 25916.

Muscovite granite. Fine; light gray. Stone Mountain Station, on Georgia Railroad, De Kalb County. Stone Mountain quarry. Tenth Census, 1880. 25905.

Hornblende biotite gneiss. Fine; dark gray. Atlanta, Fulton County. P. Lynch's quarry. Tenth Census, 1880. 25892.

Gneiss [with pagodite]. Light green. A gneissoid rock containing green pagodite. Pagodite is a soft hydrous rock, from which the Chinese sometimes carve miniature pagodas; hence its name. 3¼ by 4 by 2 inches. Near Washington, Wilkes County. Prof. C. N. Shepard, 1880. 26818.

IDAHO.

Sandstone. Coarse; light colored. Near Boisé City, Ada County. Penitentiary quarry. Tenth Census. 26660.

—— Coarse; light colored. Near Boisé City, Ada County. Penitentiary quarry. Tenth Census. 26661.

ILLINOIS.

Limestone. Sub-Carboniferous; semi-crystalline; dark gray. Two specimens. Shetlerville, Hardin County. G. A. Craiger's quarry. Tenth Census, 1880. 26393.

—— Sub-Carboniferous; finely fossiliferous; brown. Near Chester, Randolph County. J. Hern's quarry. Tenth Census, 1880. 25744.

—— Sub-Carboniferous; semi-crystalline; dark gray. Chester, Randolph County. J. Hern's quarry. Tenth Census, 1880. 25685.

—— Sub-Carboniferous; semi-crystalline; light gray. Near Chester, Randolph County. Quarry of Southern Illinois Penitentiary. Tenth Census, 1880. 25686.

Limestone. Sub-Carboniferous; fossiliferous; light colored. Near Columbia, Monroe County. Quarry of P. Frierdich & Son. Tenth Census, 1880. 27194.

—— Compact; fossiliferous; yellow. Quincy, Adams County. Centennial, 1876. 17510.

—— Upper Silurian; compact; very light colored. 15-inch cube. Lemont, Cook County. Singer & Talcott Stone Company. J. S. F. Batchen, 1883. 27512.

—— Compact; light colored; oolitic. Near Jonesborough, Union County. C. G. Flaugh's quarry. Tenth Census, 1880. 26726.

—— Light colored; oolitic. Near Jonesborough, Union County. Fullenweiler's quarry. Tenth Census, 1880. 26727.

—— Light colored; oolitic. Near Jonesborough, Union County. Dougherty's quarry. Tenth Census, 1880. 26728.

—— Light colored; oolitic. Near Jonesborough, Union County. Willard's quarry. Tenth Census, 1880. 26729.

—— Compact; fossiliferous; very light colored. Rockport, Pike County. Marblehead Lime Company. J. S. F. Batchen, 1883. 27506.

—— Semi-crystalline; light colored. Kinderhook, Pike County. Marblehead Lime Company. J. S. F. Batchen, 1883. 27507.

—— Compact; light gray. Near Iuka, Marion County. Middleton quarry. Tenth Census, 1880. 25999.

—— Compact; light gray. Two specimens. Belknap, Johnson County. J. Bell's quarry. Tenth Census, 1880. 27197.

—— Compact; light colored. Sagetown, Henderson County. J. S. F. Batchen, 1882. 27199.

Siliceous magnesian limestone. Sub-Carboniferous; compact; dark drab. Near Breese, Clinton County. J. Taylor's quarry. Tenth Census, 1880. 25661.

Magnesian limestone. Fossiliferous; light colored; crystalline. Near Quincy, Adams County. O. A. Turner's quarry. Tenth Census, 1880. 27078.

Dolomite. Silurian; compact; light colored. Joliet, Will County. W. Warner's quarry. Tenth Census, 1880. 26532.

—— Upper Silurian; porous; light gray. Kankakee, Kankakee County. Kankakee Stone Company. Tenth Census, 1880. 26851.

—— Compact; light colored. North of Joliet, Will County. W. Krommeyer's quarry. Tenth Census, 1880. 26535.

—— Compact; very light drab. Near Joliet, Will County. I. Nobes's quarry. Tenth Census, 1880. 26536.

—— Compact; very light drab. Near Joliet, Will County. I. Nobes's quarry. Tenth Census, 1880. 26537.

—— Compact; light colored. North of Joliet, Will County. Quarry of Bruce & Co. Tenth Census, 1880. 26538.

—— Upper Silurian; compact; light colored. Near Joliet, Will County. Joliet Stone Company. Tenth Census, 1880. 26533.

—— Upper Silurian; compact; light colored. Joliet, Will County. Joliet Stone Company. Tenth Census, 1880. 26534.

—— Upper Silurian; compact; light colored. Near Joliet, Will County. Quarry of Sanger & Moody. Tenth Census, 1880. 26543.

—— Upper Silurian; compact; light colored. North of Joliet, Will County. Quarry of Bruce & Co. Tenth Census, 1880. 26539.

—— Upper Silurian; compact; light colored. Joliet, Will County. Quarry of Davidson Brothers. Tenth Census, 1880. 26540.

Dolomite. Upper Silurian; compact; light colored. Joliet, Will County. C. Warner's quarry. Tenth Census, 1880. 26541.

—— Upper Silurian; compact; light colored. Near Lemont, Cook County. Excelsior Stone Company. Tenth Census, 1880. 26542.

—— Upper Silurian; compact; light colored. Near Lemont, Cook County. Singer & Talcott Stone Company. Tenth Census, 1880. 26527.

—— Upper Silurian; compact; light colored. Lemont, Cook County. Chicago & Lemont Stone Company. Tenth Census, 1880. 26528.

—— Upper Silurian; compact; light colored. Near Lemont, Cook County. Chicago & Lemont Stone Company. Tenth Census, 1880. 26529.

—— Upper Silurian; compact; light colored. Near Lemont, Cook County. Illinois Stone Company. Tenth Census, 1880. 26530.

—— Upper Silurian; compact; light colored. Near Lemont, Cook County. Singer & Talcott Stone Company. Tenth Census, 1880. 26526.

—— Upper Silurian; fine; compact; light colored. Lemont, Cook County. Quarry of Boyer & Corneau. J. S. F. Batchen, 1882. 27191.

—— Upper Silurian; compact; light colored. Near Lemont, Cook County. Earnshaw & Bodenschatz's quarry. Tenth Census, 1880. 26531.

—— Upper Silurian; compact; light colored. Sag Bridge, Cook County. Enterprise Stone Company. J. S. F. Batchen, 1883. 27348.

—— Upper Silurian; compact; light colored. Sag Bridge, Cook County. J. S. F. Batchen, 1883. 27505.

—— Upper Silurian; nearly black from bituminous matter. 18-inch cube. Chicago, Cook County. Quarry of H. Rice & Son. J. S. F. Batchen, 1883. 27533.

—— Upper Silurian; cellular; dark drab. Chicago, Cook County. Quarry of Stearns & Co. J. S. F. Batchen, 1883. 27823.

—— Upper Silurian; compact; light colored. Chicago, Cook County. Ledlie & Corse, 1884. 29642.

—— Upper Silurian; compact; light colored. Chicago, Cook County. Quarry of H. Rice & Son. J. S. F. Batchen, 1883. 27501.

—— Upper Silurian; light colored; very fine and compact. Aurora, Kane County. A. Berthold's quarry. Tenth Census, 1880. 26959.

—— Upper Silurian; light colored; very fine and compact. Aurora, Kane County. A. Berthold's quarry. Tenth Census, 1880. 26960.

Bituminous dolomite. Upper Silurian; coarse; cellular; stained nearly black by bituminous matter. Near Chicago, Cook County. Artesian Well quarry. J. S. F. Batchen, 1884. 35500.

Calcareous dolomite. Sub-Carboniferous; compact; fossiliferous; dark gray. Saline, Grantfork P. O., Madison County. S. Bardill's quarry. Tenth Census, 1880. 27190.

Sandstone. Sub-Carboniferous; fine; light colored. Near Chester, Randolph County. John Hern's quarry. Tenth Census, 1880. 25832.

—— Carboniferous; fine; light brown. Near Pinkneyville, Perry County. John Day's quarry. Tenth Census, 1880. 27188.

—— Light pink; fine and compact. Two specimens. Near Dongola, Union County. F. Neibauer. Tenth Census, 1880. 27195.

—— Carboniferous; fine; light gray. Near Xenia, Clay County. William Haag's quarry. Tenth Census. 25646.

—— Sub-Carboniferous; fine; yellowish brown. Near Chester, Randolph County. Quarry of Southern Illinois Penitentiary. Tenth Census. 25687.

Sandstone. Fine; brown. Two specimens, light and dark. Near Carbondale, Jackson County. Rawle's quarry. John S. F. Batchen. 28502.

INDIANA.

Limestone. Niagara; compact; yellow and drab. Wabash, Wabash County. Quarry of Bridges & Scott. Tenth Census, 1880. 25601.

—— Niagara; compact; dark drab. North Vernon, Jennings County. Quarry of P. Conklin & Co. Tenth Census, 1880. 25589.

—— Sub-Carboniferous; compact; drab; finely fossiliferous. Oakalla, Putnam County. Centennial, 1876. 25347.

—— Sub-Carboniferous; compact; light colored. Two specimens. Near Greencastle, Putnam County. W. Steeg's quarry. Tenth Census, 1880. 25879.

—— Sub-Carboniferous; compact; drab. Spencer, Owen County. B. Schweitzer's quarry. Tenth Census, 1880. 25749.

—— Sub-Carboniferous; semi-crystalline; gray. Avoca, Lawrence County. Quarry of Thomlinson & Reid. J. S. F. Batchen, 1882. 27196.

—— Sub-Carboniferous; oolitic; light colored. Bedford, Lawrence County. Quarry of Thomlinson & Reid. J. S. F. Batchen, 1883. 27502.

—— Sub-Carboniferous; oolitic; light colored. Bedford, Lawrence County. Quarry of Thomlinson & Reid. J. S. F. Batchen, 1883. 27511.

—— Sub-Carboniferous; oolitic; dark gray. Bedford, Lawrence County. Hoosier Stone Company. General B. F. Scribner, 1885. 37422.

—— Sub-Carboniferous; oolitic; dark gray. Bedford, Lawrence County. Centennial, 1876. 25032.

—— Sub-Carboniferous; oolitic; light colored. Near Bedford, Lawrence County. Quarry of Voris, Rodgers & Co. Tenth Census, 1880. 25693.

—— Sub-Carboniferous; oolitic; light colored. Near Bedford, Lawrence County. Chicago and Bedford Stone Company. Tenth Census, 1880. 25694.

—— Sub-Carboniferous; oolitic; light colored. Bedford, Lawrence County. Centennial, 1876. 25034.

—— Sub-Carboniferous; compact; drab. Salem, Washington County. Centennial, 1876. 25036.

—— Sub-Carboniferous; oolitic; light colored. Near Salem, Washington County. E. Zink's quarry. Tenth Census, 1880. 25662.

—— Upper Silurian; coarsely fossiliferous; dark gray. Vernon, Jennings County. Centennial, 1876. 25033.

—— Compact; light, with dark blotches. Evansville, Vanderburgh County. Centennial, 1876. 25204.

—— Compact; light, with dark spots. Evansville, Vanderburgh County. Centennial, 1876. 25031.

—— Drab, dark spotted; coarsely fossiliferous. Evansville, Vanderburgh County. Centennial, 1876. 26029.

—— Light colored; oolitic; very fine grained and compact. Dressed block 26 by 14 by 13 inches. Face with carved inscription, as follows: "From Harrison County, 3 miles south of Corydon, and exists in inexhaustible quantities." Centennial Commission, 1876. 25219.

—— Light colored; oolitic. Cube 25 inches in diameter, elaborately carved; face with words Hoosier Stone Co., Bedford, Indiana; right side with carved fruits, flowers, and lion's head; left side with female head, surrounded by wreath of oak and other leaves. Gift of Hoosier Stone Company, 1886. 38861.

Bituminous limestone. Sub-Carboniferous; oolitic; light colored. **Ellettsville, Monroe County. Centennial, 1876. 25348.**

—— Sub-Carboniferous; oolitic; light colored. Near Ellettsville, Monroe County. J. Matthews & Sons' quarry. Tenth Census, 1880. 25741.

—— Sub-Carboniferous; light colored; finely fossiliferous. Stinesville, Monroe County. W. H. McHenry's quarry. Tenth Census, 1880. 25748.

—— Sub-Carboniferous; oolitic; light colored. Near Spencer, Owen County. Quarry of Howard & Denig. Tenth Census, 1880. 25750.

—— Sub-Carboniferous; oolitic; light colored. Near Fort Ritner, Lawrence County. E. B. Dixon's quarry. Tenth Census, 1880. 25683.

Bituminous magnesian limestone. Devonian; compact; dark drab. Kokomo, Howard County. G. W. Defenbaugh's quarry. Tenth Census, 1880. 25635.

Lithographic limestone. Sub-Carboniferous; compact; drab. Spencer, Owen County. Centennial, 1876. 25370.

—— Sub-Carboniferous; drab. 10½ by 7½ by 2½ inches. Silverville, Lawrence County. Centennial, 1876. 25030.

Magnesian limestone. Sub-Carboniferous; oolitic; light colored. Near Bedford, Lawrence County. Quarry of N. C. Hinsdale & Co. Tenth Census, 1880. 27075.

—— Niagara; compact; light drab. Near Oakdale, Jennings County. Hicks & Hone's quarry. Tenth Census, 1880. 25590.

—— Niagara; compact; light drab. Near Osgood, Ripley County. Quarry of Ashman & Glasgow. Tenth Census, 1880. 25596.

Siliceous limestone. Sub-Carboniferous; compact; drab. Near Putnamville, Putnam County. James Lee's quarry. Tenth Census, 1880. 25880.

Dolomite. Upper Silurian; compact; brown. Decatur, Adams County. B. P. Rice's quarry. Tenth Census, 1880. 25619.

—— Upper Silurian; compact; drab. Bluffton, Wells County. Quarry of Knapp & Gardner. Tenth Census, 1880. 25620.

—— Niagara; compact; yellowish. Wabash, Wabash County. Quarry of Moelling & Paul. Tenth Census, 1880. 25602.

—— Niagara; compact; light drab. Near Logansport, Cass County. A. Gleitz's quarry. Tenth Census, 1880. 27080.

—— Niagara; compact; drab. Marion, Grant County. S. Faukboner's quarry. Tenth Census, 1880. 27002.

—— Niagara; compact; light drab. Montpelier, Blackford County. W. Twibell's quarry. Tenth Census, 1880. 25621.

—— Niagara; compact; dark mottled. Eaton, Delaware County. G. W. Carter's quarry. Tenth Census, 1880. 25634.

—— Niagara; compact; drab. Anderson, Madison County. W. Crim's quarry. Tenth Census, 1880. 26988.

—— Niagara; compact; drab. Near Laurel, Franklin County. M. E. Secrest's quarry. Tenth Census, 1880. 25470.

—— Niagara; compact; light drab. Near Greensburgh, Decatur County. Greensburgh Limestone Company. Tenth Census, 1880. 25541.

—— Upper Silurian; compact; light colored. Greensburgh, Decatur County. Centennial, 1876. 25037.

—— Niagara; compact; light colored. Saint Paul, Decatur County. J. L. Scanlan's quarry. Tenth Census, 1880. 25540.

—— Niagara; compact; light colored. Near New Point, Decatur County. New Point quarry. Tenth Census, 1880. 25557.

Ferruginous dolomite. Niagara; compact; yellow and mottled. Two specimens. Longwood, Fayette County. W. Ball's quarry. Tenth Census, 1880. 25448.

Sandstone. Sub-Carboniferous; fine; very light colored. Paoli, Orange County. Centennial, 1876. 25035.

—— Sub-Carboniferous; fine; very light colored. French Lick Township, Orange County. T. W. Braxton's quarry. Tenth Census. 26266.

—— Sub-Carboniferous; very light gray; fine and compact. Used for oils-tones. French Lick Township, Orange County. Quarry of T. W. Braxton & Sons. Tenth Census. 26944.

—— Sub-Carboniferous; very light gray; compact; finely laminated. French Lick Township, Orange County. W. F. Osborn's quarry. Tenth Census. 26050.

—— Carboniferous; fine; very light colored. Williamsport, Warren County. B. F. Gregory's estate. Tenth Census. 25591.

— Carboniferous; gray; medium. Attica, Fountain County. S. Bernhart's quarry. Tenth Census. 25597.

—— Carboniferous; fine; light reddish brown. Near Cannelton, Perry County. A. Hallabach's quarry. Tenth Census. 26208.

INDIAN TERRITORY.

Limestone. Nearly white; crystalline. Portion of memorial stone in Washington Monument. Cherokee Nation. Dennis O'Leary, 1885. 37628.

IOWA.

Gypsum. Coarse; gray. Fort Dodge, Webster County. Quarries of Cardiff Plaster Mills Company. Tenth Census, 1880. 26804.

Magnesian limestone [marble]. Devonian; compact; non-crystalline; argillaceous; with many fossil shells and large corals; prevailing colors drab, gray, and brownish. Three specimens. One large slab 2 by 4 feet by 1½ inches thick; one small slab 6 inches square by ½ inch thick and one 4-inch cube. Charles City, Floyd County. Charles City Marble Company. J. S. Trigg, 1886. 38465.

Dolomite. Lower Silurian; porous; light colored. Lansing, Allamakee County. J. Nelson's quarry. Tenth Census, 1880. 26217.

—— Lower Silurian; coarse; vesicular. Lansing, Allamakee County. Haney's quarry. R. Hufschmidt, 1881. 26682.

—— Lower Silurian; fine; light colored. South Lansing, Allamakee County. J. Nelson's quarry. R. Hufschmidt, 1881. 26683.

—— Lower Silurian; compact; brown. Dubuque, Dubuque County. W. Rebman's quarry. Tenth Census, 1880. 25894.

—— Lower Silurian; coarse; buff. Dubuque, Dubuque County. F. W. Kringle's quarry. Tenth Census, 1880. 25868.

—— Lower Silurian; compact; buff. Dubuque, Dubuque County. Quarry of Speer and Lee. Tenth Census, 1880. 25870.

—— Upper Silurian; drab; mottled. Near Manchester, Delaware County. Quarry of C. A. & S. A. Davis. Tenth Census, 1880. 25899.

—— Upper Silurian; fine; light colored. Near Farley, Dubuque County. Quarry of C. E. De Rome & Co. Tenth Census, 1880. 25897.

—— Upper Silurian; fine; light colored. Two specimens. Near Farley, Dubuque County. B. N. Arquitte's quarry. Tenth Census, 1880. 25893.

Upper Silurian; fine; buff. Near Monticello, Jones County. J. S. Fuller's quarry. Tenth Census, 1880. 25895.

Dolomite. Devonian; fine; light buff and drab; coarsely fossiliferous. Two specimens. Near Osage Station, Mitchell County. Armstrong's quarry. Tenth Census, 1880. 26122.

—— Devonian; dark; compact. Near Mason City, Cerro Gordo County. J. L. Parker's quarry. Tenth Census, 1880. 26065.

—— Devonian; fine; buff and coarse drab. Two specimens. Near Bristow, Butler County. E. Frick's quarry. Tenth Census, 1880. 26088.

—— Devonian; fine; compact. Cedar Falls, Black Hawk County. E. Carpenter's quarry. Tenth Census, 1880. 25900.

—— Devonian; fine; yellowish brown. Two specimens. Near Laporte City, Black Hawk County. G. A. Knowles's quarry. Tenth Census, 1880. 26764.

—— Sub-Carboniferous; compact; drab. Near Dakotah Station, Humboldt County. Quarry of Miner & Howell. Tenth Census, 1880. 26067.

—— Sub-Carboniferous; fine; compact. Humboldt, Humboldt County. A. B. Snyder's quarry. Tenth Census, 1880. 26062.

—— Sub-Carboniferous; compact, with red blotches. Humboldt, Humboldt County. C. A. Labeer's quarry. Tenth Census, 1880. 26063.

—— Sub-Carboniferous; light brown. Near Iowa Falls, Hardin County. G. W. Chapman's quarry. Tenth Census, 1880. 25986.

—— Sub-Carboniferous; compact; brown. Near Iowa Falls, Hardin County. L. L. Kelly's quarry. Tenth Census, 1880. 26705.

—— Sub-Carboniferous; fine; buff. Quarry, Marshall County. Le Grand Quarry Company. Tenth Census, 1880. 25479.

—— Sub-Carboniferous; fine; light brown. Near Ames, Story County. P. R. Craig's quarry. Tenth Census, 1880. 25498.

—— Sub-Carboniferous; fine; drab. Near Ames Station, Story County. R. Coe's quarry. Tenth Census, 1880. 25466.

—— Sub-Carboniferous; light gray; quartz-bearing. Keokuk, Lee County. P. Tigue's quarry. Tenth Census, 1880. 25369.

—— Sub-Carboniferous; finely vesicular. Near Franklin, Lee County. C. Graner's quarry. Tenth Census, 1880. 25368.

—— Niagara; drab; mottled. Delhi, Delaware County. F. B. Doolittle's quarry. Tenth Census, 1880. 25701.

Siliceous dolomite. Lower Silurian; coarse; variegated. Lansing, Allamakee County. City of Lansing Quarries. Tenth Census, 1880. 26803.

—— Upper Silurian; buff; porous. Near Postville, Allamakee County. E. H. William's quarry. Tenth Census, 1880. 26215.

—— Devonian; compact. Near Waterloo, Black Hawk County. W. Lane's quarry. Tenth Census, 1880. 25933.

—— Niagara; buff; dendritic. Near Delhi, Delaware County. J. H. Peter's quarry. Tenth Census, 1880. 25702.

Ferruginous dolomite. Upper Silurian; coarse and fine; buff. Two specimens. Near Sabula, Jackson County. E. A. Wood's quarry. Tenth Census, 1880. 25865.

—— Upper Silurian; buff. Near Maquoketa, Jackson County. A. Connel's quarry. Tenth Census, 1880. 25830.

—— Upper Silurian; coarse; yellow. Clinton, Scott County. T. Purcell's quarry. Tenth Census, 1880. 25829.

—— Upper Silurian; fine; light buff. Near Le Claire, Scott County. E. Thelemann's quarry. Tenth Census, 1880. 25826.

Ferruginous dolomite. Upper Silurian; coarse, yellow; and fine, light buff. Two specimens. Near Dixon Station, Clinton County. J. D. Binford's quarry. Tenth Census, 1880. 25828.

Bituminous dolomite. Upper Silurian; compact; very light colored. Stone City, Jones County. H. Dearborn's quarry. Tenth Census, 1880. 25901.

—— Upper Silurian; compact; very light colored. Two specimens. Stone City, Jones County. Quarry of James & Rowen. Tenth Census, 1880. 25902.

—— Upper Silurian; compact; very light colored. Stone City, Jones County. J. A. Green's quarry. Tenth Census, 1880. 25931.

—— Upper Silurian; fine; light colored. Near Anamosa, Jones County. Quarry of Iowa State Penitentiary. Tenth Census, 1880. 25565.

—— Upper Silurian; fine; light buff. Near Olin, Jones County. A. Rummel's quarry. Tenth Census, 1880. 25705.

—— Upper Silurian; coarse; porous. Hale, Jones County. O. Horton's quarry. Tenth Census, 1880. 25703.

—— Upper Silurian; fine; very light buff. Near Mount Vernon, Johnson County. J. P. McCune's quarry. Tenth Census, 1880. 25572.

—— Upper Silurian; buff; porous. Near Dixon Station, Clinton County. J. D. Binford's quarry. Tenth Census, 1880. 26213.

—— Upper Silurian; fine; light buff. Le Claire, Scott County. J. Gamble's quarry. Tenth Census, 1880. 25827.

Calcareous dolomite. Sub-Carboniferous; fine; light colored. Quarry, Marshall County. Le Grand Quarry Company. Tenth Census, 1880. 25478.

—— Devonian; drab; compact; crinoidal. Buffalo, Scott County. C. Metzger's quarry. Tenth Census, 1880. 25711.

—— Carboniferous; light colored; fossiliferous. Near Winterset, Madison County. Quarry of W. H. Lewis. Tenth Census, 1880. 27160.

Bituminous limestone and dolomite. Devonian; fine; drab. Two specimens. Near Garrison, Benton County. Quarry of Kokbrick & Frazer. Tenth Census, 1880. 25951.

Bituminous limestone. Devonian; fine; light colored. Near Vinton, Benton County. Quarry of S. Anngst. Tenth Census, 1880. 25950.

—— Sub-Carboniferous; light colored; oolitic. Near Durham Station, Marion County. C. C. Collins's quarry. Tenth Census, 1880. 26214.

Magnesian limestone. Lower Silurian; drab; dark mottled. Decorah, Winneshiek County. T. Dwyer's quarry. Tenth Census, 1880. 26133.

—— Sub-Carboniferous; oolitic; light colored. Near Le Grand, Tama County. Le Grand Quarry Company. Tenth Census, 1880. 25477.

—— Carboniferous; compact; drab. Fort Dodge, Webster County. J. Linebon's quarry. Tenth Census, 1880. 25987.

—— Devonian; drab. Near Charles City, Floyd County. J. S. Trigg's quarry. Tenth Census, 1880. 26390.

—— Devonian; dark; compact. Near Mason City, Cerro Gordo County. Quarry of A. T. Lien & Bro. Tenth Census, 1880. 26066.

—— Compact; light colored. Two specimens. Waverly, Bremer County. G. R. Dean's quarry. Tenth Census, 1880. 26076.

Limestone. Devonian; fine; light colored. Near Mason City, Cerro Gordo County. Quarry of Poyfier & Son. Tenth Census, 1880. 26064.

—— Devonian; fine and coarse. Two specimens. Near Marble Rock, Floyd County. Quarry of Boone & Bros. Tenth Census, 1880. 26392.

Limestone. Devonian; buff; fossiliferous. Two specimens. Near Independence, Buchanan County. J. Forrester's quarry. Tenth Census, 1880. 25932.

—— Devonian; brown; cellular. Iowa City, Johnson County. L. O. Hoffman's quarry. Tenth Census, 1880. 25409.

—— Devonian; light colored; finely fossiliferous. Near Iowa City, Johnson County. D. A. Schaeffer's quarry. Tenth Census, 1880. 25410.

—— Devonian; drab. Two specimens. Davenport, Scott County. W. L. Cook's quarry. Tenth Census, 1880. 25866.

—— Devonian; coarsely fossiliferous. Near Davenport, Scott County. Heinrich Schmiedt's quarry. Tenth Census, 1880. 25867.

—— Devonian; fine; drab. Davenport, Scott County. A. C. Fulton's quarry. Tenth Census, 1880. 26216.

—— Upper Silurian; fine; light colored. Two specimens. Near Tipton, Cedar County. Quarry of Shearer & Gray. Tenth Census, 1880. 25575.

—— Sub-Carboniferous; coarse brown and fine, light colored. Two specimens. Near Iowa Falls, Hardin County. L. L. Kelly's quarry. Tenth Census, 1880. 26684.

—— Sub-Carboniferous; light colored; oolitic. Conrad, Grundy County. W. T. Creceline's quarry. Tenth Census, 1880. 26391.

—— Sub-Carboniferous; oolitic; light colored and reddish. Two specimens. Near Montour, Tama County. Quarry of Ruggles & Stevens. Tenth Census, 1880. 25476.

—— Sub-Carboniferous; finely fossiliferous. Quarry, Marshall County. Le Grand Quarry Company. Tenth Census, 1880. 25480.

—— Sub-Carboniferous; buff and light gray; semi-crystalline. Two specimens. Near Washington, Washington County. Quarry of Minnick & Donovan. Tenth Census, 1880. 25623.

—— Sub-Carboniferous; compact; light colored. Near Sigourney Station, Keokuk County. William S. Booten's quarry. Tenth Census, 1880. 25624.

—— Sub-Carboniferous; compact; light colored. Sigourney, Keokuk County. R. Pilkington's quarry. Tenth Census, 1880. 25625.

—— Sub-Carboniferous; light colored and drab. Two specimens. Near Givin, Mahaska County. F. Castle's quarry. Tenth Census, 1880. 25648.

—— Sub-Carboniferous; fine; light colored. Near Pella, Marion County. F. C. Mathe's quarry. Tenth Census, 1880. 25896.

—— Sub-Carboniferous; compact; drab. Near Ottumwa, Wapello County. B. W. Jeffries's quarry. Tenth Census, 1880. 25443.

—— Sub-Carboniferous; compact; drab; oolitic. Near Ottumwa, Wapello County. J. Kelly's quarry. Tenth Census, 1880. 25445.

—— Sub-Carboniferous; light drab; oolitic and drab; fossil-bearing. Two specimens. Dudley Station, Wapello County. Quarry of Beckwith & Winters. Tenth Census, 1880. 25411.

— Sub-Carboniferous; gray; micaceous. Two specimens. Near Fairfield, Jefferson County. S. Stieber's quarry. Tenth Census, 1880. 25622.

—— Sub-Carboniferous; fine; drab. Near Mount Pleasant, Henry County. P. O'Connor's quarry. Tenth Census, 1880. 25339.

—— Sub-Carboniferous; fine; very light gray and drab. Two specimens. Near Mount Pleasant, Henry County. J. Rukgaber's quarry. Tenth Census, 1880. 25340.

—— Sub-Carboniferous; fine; light colored. Burlington, Des Moines County. "Star" quarry. Tenth Census, 1880. 26493.

Limestone Sub-Carboniferous; light colored; semi-crystalline. Two specimens. Burlington, Des Moines County. Tenth Census, 1880. 25329.

—— Sub-Carboniferous; light colored; oolitic. Burlington, Des Moines County. South Hill quarries. Tenth Census, 1880. 26490.

—— Sub-Carboniferous; coarse; buff. Burlington, Des Moines County. South Hill quarries. Tenth Census, 1880. 26491.

—— Sub-Carboniferous; fine; compact. Near Franklin, Lee County. C. Graner's quarry. Tenth Census, 1880. 25368.

—— Sub-Carboniferous; light colored and gray. Two specimens. Bentensport, Van Buren County. G. W. Jack's quarry. Tenth Census, 1880. 25442.

—— Sub-Carboniferous; fine; drab. Two specimens. Near Keosauqua, Van Buren County. J. Creasy's quarry. Tenth Census, 1880. 26218.

—— Carboniferous; fine; fossil-bearing. Two specimens. Stennett, Montgomery County. W. Stennett's quarry. Tenth Census, 1880. 25413.

—— Carboniferous; coarse; light buff. Bedford, Taylor County. H. W. Greenlee's quarry. Tenth Census, 1880. 25893.

—— Carboniferous; light drab; fossiliferous. Bedford, Taylor County. Quarry of H. W. Green & Co. Tenth Census, 1880. 26802.

—— Carboniferous; light colored; finely fossiliferous. Near Earlham, Madison County. Quarry of Laird & Royce. Tenth Census, 1880. 25461.

—— Carboniferous; light colored and drab; fossiliferous. Two specimens. Near Tracy Station, Marion County. Quarry of Regan Bros. & McGorrich. Tenth Census, 1880. 25464.

—— Carboniferous; light colored; finely fossiliferous. Near Winterset, Madison County. Quarry of H. W. Lewis. Tenth Census, 1880. 25475.

—— Carboniferous; light colored; fossil-bearing. Near Winterset, Madison County. G. W. Hetyler's quarry. Tenth Census, 1880. 27184.

—— Carboniferous; compact; drab. Near Earlham, Madison County. Quarry of Robertson & Willoughby. Tenth Census, 1880. 25462.

—— Carboniferous; light colored; fossiliferous. Near Earlham, Madison County. Tenth Census, 1880. 25463.

—— Carboniferous; light and dark drab. Two specimens. Near Macedonia, Pottawattamie County. S. Dye's quarry. Tenth Census, 1880. 25446.

Siliceous limestone. Devonian; dark mottled. Iowa City, Johnson County. E. Crowley's quarry. Tenth Census, 1880. 25408.

—— Sub-Carboniferous; gray; porous. Near Knoxville, Marion County. Garrison quarry. Tenth Census, 1880. 25675.

—— Carboniferous; light colored; fossiliferous. Near Corning, Adams County. Quarry of Law & Oak. Tenth Census, 1880. 25412.

Sandstone. Carboniferous; coarse; dark brown. Near Muscatine, Muscatine County. A. M. Hare's quarry. Tenth Census. 25593.

—— Fine; very light colored. Davenport, Scott County. Goettsch's quarry. Tenth Census. 25745.

Ferruginous sandstone. Cretaceous; coarse; dark brown. Lewis, Cass County. J. Woodward's quarry. Tenth Census. 25447.

KANSAS.

Limestone. Permian; light colored; porous; fossiliferous. Marysville, Marshall County. Quarry of Erl & Patterson. Tenth Census, 1880. 25419.

—— Permian; coarse; porous; light colored. Two specimens. Blue Rapids, Marshall County. Blue Rapids quarry. Tenth Census, 1880. 25438.

Limestone. Permian; coarsely porous; fusulina; light colored. Near Frankfort, Marshall County. Joseph Wilson's quarry. Tenth Census, 1880. 25397.

—— Permian; light colored; fusulina. Beattie, Marshall County. Tenth Census, 1880. 25420.

—— Permian; compact; coarsely porous, with many fossil fusulina. Two specimens. Bigelow, Marshall County. H. F. Gallagher's quarry. Tenth Census, 1880. 25437.

—— Permian; light colored; compact; finely fossiliferous. Near Manhattan, Riley County. Quarry of Ulrich Brothers. Tenth Census, 1880. 26502.

—— Permian; coarse; porous; fusulina. Near Manhattan, Riley County. Quarry of Ulrich Brothers. Tenth Census, 1880. 26503.

—— Permian; light colored; fine; cellular. Near Dunlap, Morris County. Quarry of Wolff, Pickens & Co. Tenth Census, 1880. 26091.

—— Permian; light colored; compact; finely fossiliferous. Near Cottonwood Station, Chase County. Quarry of L. W. Lewis. Tenth Census, 1880. 26090.

—— Permian; light colored; compact; fusulina. Near Cottonwood Station, Chase County. Quarry of Lantry & Burr. Tenth Census, 1880. 26098.

—— Permian; light colored; fossiliferous; cellular. Near Douglass, Butler County. Tenth Census, 1880. 26364.

—— Permian; light colored; soft; porous; fossiliferous. Near Douglass, Butler County. W. Dickensheet's quarry. Tenth Census, 1880. 26365.

—— Permian; drab; fine and compact. Two specimens. Near Rock Township, Butler County. Smith's quarry. Tenth Census, 1880. 26363.

—— Permian; fine; light colored; fossiliferous. Near El Dorado, Butler County. Polwin's quarry. Tenth Census, 1880. 26356.

—— Permian; light colored; fine and compact. Near El Dorado, Butler County. Poor Farm quarry. Tenth Census, 1880. 26357.

—— Permian (?); light colored; porous. Near El Dorado, Butler County. Van Dorner's quarry. Tenth Census, 1880. 26361.

—— Permian; light colored; compact and coarsely porous. Two specimens. Near El Dorado, Butler County. Sharper's quarry. Tenth Census, 1880. 26362.

—— Permian; light colored; soft; porous; fossiliferous. Near Augusta, Butler County. J. C. Haines's quarry. Tenth Census, 1880. 26130.

—— Permian; light colored; soft; porous; fossiliferous. Near Augusta, Butler County. Barker's quarry. Tenth Census, 1880. 26367.

—— Permian; light colored; soft; porous; fossiliferous. Near Augusta, Butler County. Ward's quarry. Tenth Census, 1880. 26368.

—— Permian; light colored; fusulina. Near Augusta, Butler County. Aldrich's quarry. Tenth Census, 1880. 26369.

—— Permian; fine grained; light colored. Near Winfield, Cowley County. Quarry of Hodges, Moore & Co. Tenth Census, 1880. 26577.

—— Permian; gray; fusulina. Near Grenola, Elk County. Railroad quarry. Tenth Census, 1880. 26574.

—— Cretaceous; white; chalky; used in the manufacture of whiting. Kirwin, Phillips County. Kirwin quarry. Tenth Census, 1880. 25455.

—— White; chalky; used in the manufacture of whiting. Wa Keeney, Trego County. Railroad quarry. Tenth Census, 1880. 26499.

—— White; chalky. On Smoky River, Trego County. Tenth Census, 1880. 26500.

—— Light; fine and porous. Bull's City, Osborne County. Tenth Census, 1880. 25474.

Limestone. Light colored; soft and earthy. Junction City, Davis County. Centennial, 1876. 25028.

—— Dark; coarse; fossiliferous. Oswego, Labette County. Hoy's quarry. Tenth Census, 1880. 25790.

—— Fine; light buff. Beloit, Mitchell County. Tenth Census, 1880. 25441.

—— Buff; coarsely porous. Near Greeley, Anderson County. Greeley quarry. Tenth Census, 1880. 26099.

—— Light colored; porous; fossiliferous. Near Armstrong, Wyandotte County. T. F. Sullivan's quarry. Tenth Census, 1880. 25396.

—— Buff; fine and compact. Near Wilson, Ellsworth County. Railroad quarry. Tenth Census, 1880. 26481.

—— Fine; light buff. Near El Dorado, Butler County. Tenth Census, 1880. 26358.

—— Carboniferous; dark; compact; finely fossiliferous. Near Atchison, Atchison County. Quarry of Reddington & Co. Tenth Census, 1880. 25375.

—— Carboniferous; light colored; finely fossiliferous. Two specimens. Near Lane, Franklin County. Quarry of Hanway Brothers. Tenth Census, 1880. 25796.

Limestone [marble.] Drab, dark spotted; very compact and close grained. 4½ by 2¼ by 1 inches. Leavenworth, Leavenworth County. United States General Land Office, 1882. 27282.

—— Dark brown, nearly black, with white fossils. 3¼ by 3¼ by 1 inches. Bourbon County. United States General Land Office, 1883. 27283.

Magnesian limestone. Carboniferous; dark; fossiliferous. Fort Scott, Bourbon County. W. L. Wilkinson's quarry. Tenth Census, 1880. 25680.

—— Buff; fine and compact. Leavenworth, Leavenworth County. Tenth Census, 1880. 25460.

—— Permian; light colored; finely fossiliferous. Near Cottonwood Station, Chase County. Quarry of Tweeddale & Parker. Tenth Census, 1880. 26097.

—— Permian; light colored; finely fossiliferous. Florence, Marion County. A. F. Horner's quarry. Tenth Census, 1880. 26093.

Dolomite. Coarse; porous; fossiliferous. Near Salina, Saline County. Tenth Census, 1880. 26501.

—— Permian; fine grained; light colored. Near Marion Centre, Marion County. Quarry of Groat & Bros. Tenth Census, 1880. 26092.

—— Permian; fine; light buff. Near Marion Centre, Marion County. Orner Gee's quarry. Tenth Census, 1880. 26094.

—— Permian; light colored; fine grained. Near Marysville, Marshall County. White's quarry. Tenth Census, 1880. 25418.

—— Carboniferous; compact; fossiliferous. Two specimens. Near Topeka, Shawnee County. Quarry of Mulvane & Higginbotham. Tenth Census, 1880. 26572.

Siliceous dolomite. Permian; fine; light colored; porous. Richland Township, Butler County. Tenth Census, 1880. 26366.

Bituminous dolomite. Permian; fine; light colored. Near Winfield, Cowley County. C. Schmidt's quarry. Tenth Census, 1880. 26573.

Sandstone. Carboniferous; fine; gray. Near Fort Scott, Bourbon County. Quarry of Gilfillan Bros. 25681.

—— Fine; brown. Near Oswego, Labette County. Bailey's quarry. Tenth Census. 25791.

Sandstone. Fine; light colored. Near Parsons, Neosho County. Quarry of Jones & Hayes. Tenth Census. 25792.

—— Fine; gray. Near Parsons, Neosho County. Emory's quarry. Tenth Census. 25793.

—— Fine; light buff. Near Chanute, Neosho County. "Railroad" quarry. Tenth Census. 26580.

—— Carboniferous; dark gray; medium. Near Pawnee, Crawford County. Pawnee, Flagstone Coun'y. Tenth Census. Two specimens. 25794.

—— Fine; light buff. Neodesha, Wilson County. "Neodesha" quarry. Tenth Census. 26575.

—— Dark buff; medium. Larned, Pawnee County. N. J. Krusen's quarry. Tenth Census. 26576.

KENTUCKY.

Limestone. Light drab; finely fossiliferous; compact. Louisville, Jefferson County. City of Louisville quarry. Tenth Census, 1880. 26311.

—— Drab; fine and compact. Anchorage, Jefferson County. Quarry of Reilly Bros. J. S. F. Batchen, 1883. 28108.

—— Drab; compact and somewhat oolitic. Near Franklin, Simpson County. Paris quarry. J. R. Procter, 1884. 36888.

—— Drab; fine and compact. Pilot Knob, Simpson County. J. R. Procter, 1884. 36897.

—— Drab; compact. Near Frankfort, Franklin County. Mrs. Pettis's quarry. J. R. Procter, 1884. 36908.

—— Drab; finely fossiliferous. Greensburgh, Green County. Garrard Lyle's quarry. J. R. Procter, 1884. 36902.

—— Dark drab; compact. Russellville, Logan County. J. R. Procter, 1884. 36915.

—— Dark drab; fine and compact. Simpson County. J. R. Procter, 1884. 36893.

—— Light colored; finely fossiliferous; cellular. Near Bowling Green, Warren County. Belknap & Dumesnil Stone Company. Tenth Census, 1880. 26285.

—— Light colored; oolitic. Princeton, Caldwell County. S. McElfatrick's quarry. J. R. Procter, 1884. 36946.

—— Light colored; fossiliferous. Bloomfield, Nelson County. J. R. Procter, 1884. 36916.

—— Light colored; oolitic, with fossils. Russellville, Logan County. Quarry of Burgher & Ryan. J. R. Procter, 1884. 36949.

—— Light colored; very fine and compact. Near Franklin, Simpson County. J. R. Procter, 1884. 36889.

—— Light colored; semi-crystalline. Near Frankfort, Franklin County. Major Williams's quarry. J. R. Procter, 1884. 36911.

—— Light colored; finely fossiliferous. Near Frankfort, Franklin County. Mr. Quire's quarry. J. R. Procter, 1884. 36912.

—— Light colored; coarsely fossiliferous. About 5 by 4 by 1½ inches. Near Bedford, Trimble County. S. Barnes's farm. J. R. Procter, 1884. 36969.

—— Light gray; finely fossiliferous; compact. Near Frankfort, Franklin County. Butterman's quarry. J. R. Procter, 1884. 36913.

—— Light colored; oolitic. Near Trenton, Todd County. J. R. Procter, 1884. 36948.

—— Dark; compact. Livingstone, Rockcastle County. Rockcastle quarry. J. R. Procter, 1884. 36921.

—— Fine; light gray. Lincoln County. J. R. Procter, 1884. 36931.

Limestone. Sub-Carboniferous; light colored; oolitic. Princeton, Caldwell County. J. R. Procter, 1884. 36940.

—— Sub-Carboniferous; fine; drab. Princeton, Caldwell County. J. R. Procter, 1884. 36941.

—— Sub-Carboniferous; light colored; oolitic. Near Princeton, Caldwell County. Garrett's quarry. J. R. Procter, 1884. 36943.

—— Gray; semi-crystalline; fossiliferous. Princeton, Caldwell County. S. McElfatrick's quarry. J. R. Procter, 1884. 36944.

—— Sub-Carboniferous; very light drab; oolitic. Princeton, Caldwell County. S. McElfatrick's quarry. J. R. Procter, 1884. 36945.

—— Corniferous; fine; dark gray. Stewart's Mill, Clark County. J. R. Procter, 1884. 36906.

—— Corniferous; drab; compact. Lebanon, Marion County. J. R. Procter, 1884. 36910.

—— Lower Silurian; dark gray; coarsely fossiliferous. Bloomfield, Nelson County. J. R. Procter, 1884. 36914.

—— Sub-Carboniferous; drab; fine and compact. Dennis, Logan County. J. R. Procter, 1884. 36918.

—— Sub-Carboniferous; light colored; oolitic. Pilot Knob, Simpson County. J. R. Procter, 1884. 36887.

—— Very light brown; fine and compact. Simpson County. J. R. Procter, 1884. 36892.

—— Sub-Carboniferous; light colored; oolitic. Near Garrett, Meade County. J. R. Procter, 1884. 36960.

—— Sub-Carboniferous; dark mottled; semi-crystalline. Grahampton, Meade County. 36961.

—— Sub-Carboniferous; dark gray; finely fossiliferous; compact. Green County. J. R. Procter, 1884. 36903.

—— Fine; drab; compact. Pineville, Bell County. J. R. Procter, 1884. 36924.

—— Dark mottled; semi-crystalline; compact. Near Litchfield, Grayson County. J. Cubbage's quarry. J. R. Procter, 1884. 36954.

—— Sub-Carboniferous; light colored; oolitic. Near Litchfield, Grayson County. Joe Butler's quarry. J. R. Procter, 1884. 36955.

—— Dark gray; semi-crystalline. Litchfield, Grayson County. J. R. Procter, 1884. 36957.

—— Lower Salurian; gray; coarsely fossiliferous. Taylorsville, Spencer County. J. R. Procter, 1884. 36909.

—— Sub-Carboniferous; light colored; oolitic. Hopkinsville, Christian County. J. R. Procter, 1884. 36900.

—— Gray; coarsely fossiliferous. Springfield, Washington County. J. R. Procter, 1884. 36934.

Magnesian limestone. Coarse; dark mottled. Lulbegrude Creek, Clark County. J. R. Procter, 1884. 36907.

—— Upper Silurian; yellowish; compact. Nelson County. J. R. Procter, 1884. 36904.

—— Upper Silurian; fine; light gray. Near Lagrange, Oldham County. Anita Springs quarry. J. R. Procter, 1884. 36932.

Bituminous limestone. Dark; compact; fossiliferous. Lebanon, Marion County. J. R. Procter, 1884. 36919.

—— Dark drab; fine and compact. Simpson County. J. R. Procter, 1884. 36895.

Bituminous limestone. Dark; compact. Pineville, Bell County. J. R. Procter, 1884. 36923.

Dolomite. Upper Silurian; drab; compact. Bardstown, Nelson County. J. R. Procter, 1884. 36917.

—— Corniferous; drab, mottled; semi-crystalline. Lincoln County. Lincoln Sand Company. J. R. Procter, 1884. 36930.

Sandstone. Fine; light colored. Pilot Knob, Simpson County. J. R. Procter. 36891.

—— Fine; light yellowish. Pilot Knob, Simpson County. J. R. Procter. 36896

—— Calcareous; fine; very light gray. Taylor County. Land of George Lee. J. R. Procter, 1884. 36899.

—— Fine; very light gray. Livingstone, Rockcastle County. J. R. Procter. 36920.

—— Fine; light gray, with dark stains. Near Pineville, Bell County. Land of A. J. Arker. J. R. Procter. 36925.

—— Fine; light blue-gray. Near Pineville, Bell County. Land of R. M. Moss. J. R. Procter. 36926.

—— Fine; light colored. Near Pineville, Bell County. Land of R. M. Moss. J. R. Procter. 36927.

—— Sub-Carboniferous; fine; very light gray. Blue Lick Mountain, Madison County. Land of William Adams. J. R. Procter. 36928.

—— Carboniferous; very light brown; medium. Johnson County. J. R. Procter. 36936.

—— Carboniferous; very light brown; medium. Johnson County. J. R. Procter. 36937.

—— Fine; light pinkish. Kirkmansville, Todd County. Quarry of R. F. Boss. J. R. Procter. 36942.

—— Fine; very light blue-gray. Whitley County. J. R. Procter. 36950.

—— Fine; light colored. Whitley County. J. R. Procter. 36951.

—— Fine; light pinkish. Grayson Springs, Grayson County. J. R. Procter. 36952.

—— Fine; light colored. Grayson Springs, Grayson County. J. R. Procter. 36953.

—— Sub-Carboniferous; fine; nearly white. Near Marion, Crittenden County. J. R. Procter. 36958.

—— Sub-Carboniferous; fine; buff. Near Cloverport, Breckinridge County. J. R. Procter. 36964.

—— Sub-Carboniferous; fine; light brown. Near Cloverport, Breckinridge County. J. R. Procter. 36966.

—— Sub-Carboniferous; fine; light colored. Near Cloverport, Breckinridge County. J. R. Procter. 36967.

LOUISIANA.

Sandstone. Fine; light colored. 37579.

Quartzite. Dark drab and white, mottled; very fine and compact. Two specimens. 37602.

MAINE.

Serpentine. Compact; dark green, nearly black; takes but a dull polish. Deer Isle, Hancock County. George H. Holden, 1884. 36019.

Biotite granite. Coarse; gray. Biddeford, York County. C. H. Bragdon's quarry. Tenth Census, 1880. 26297.

—— Coarse; gray. Biddeford, York County. J. M. Andrew's quarry. Tenth Census, 1880. 26316.

Biotite granite. Coarse; gray. Biddeford, York County. Quarry of C. H. & A. Goodwin. Tenth Census, 1880. 26317.

—— Broken column; pink. 7½ by 14 inches. Near Red Beach, Washington County. Maine Red Granite Company. Tenth Census, 1880. 26765.

—— Coarse; pink; used for ornamental work and monuments. Near Red Beach, Washington County. Maine Red Granite Company. Tenth Census, 1880. 25684.

—— Coarse; pink; used as above. Jonesborough, Washington County. Bodwell Granite Company. Tenth Census, 1880. 25872.

—— Coarse; pink; used very largely for monumental work. Jonesborough, Washington County. Colonel Clark. 25002.

—— Medium; gray. Two specimens. 6-inch cube. Waldo County. Tenth Census. 1880. 25029.

—— Coarse; gray; used for general building. Frankfort, Waldo County. Mount Waldo Granite Works. Tenth Census, 1880. 27035.

—— Gray; coarsely porphyritic. Frankfort, Waldo County. Mount Waldo Granite Works. Tenth Census, 1880. 27036.

—— Fine; gray. Swanville, Waldo County. Oak Hill Granite Company. Tenth Census, 1880. 26485.

—— Coarse; dark gray. Canaan, Somerset County. S. L. Fowler's quarry. Tenth Census, 1880. 26296.

—— Fine; dark gray. Round Pond, Lincoln County. Quarry of Brown, McAllister & Co. Tenth Census, 1880. 26242.

—— Fine; dark gray. 6 by 6 by 4 inches. Round Pond, Lincoln County. Quarry of Brown, McAllister & Co. Tenth Census, 1880. 26974.

—— Fine; gray. Vinal Haven, Knox County. J. S. Black's quarry. Tenth Census, 1880. 26165.

—— Fine; gray. Vinal Haven, Knox County. Duscham Hill quarry. Bodwell Granite Company. Tenth Census, 1880. 26166.

—— Coarse; gray, slightly pinkish. Vinal Haven, Knox County. Harbor quarry. Bodwell Granite Company. Tenth Census, 1880. 26153.

The Vinal Haven granites are used for all manner of building and monumental work.

—— Coarse; gray. Hurricane Island, Knox County. D. Tilson's quarry. Tenth Census, 1880. 26180.

—— Coarse; gray, slightly pinkish. 6-inch cube. Rockland, Knox County. George's River Granite Company. 25067.

—— Coarse; gray; used in the construction of the United States Treasury building at Washington. Dix Island, Knox County. Dix's Island Granite Company. Tenth Census, 1880. 26182.

—— Fine; dark gray. South Thomaston, Knox County. Quarry of M. T. Jameson & Co. Tenth Census, 1880. 26181.

—— Fine; granite. Vinal Haven, Knox County. East Boston quarry. Bodwell Granite Company. Tenth Census, 1880. 26154.

—— Fine; light gray. Saint George, Knox County. Long Cove Granite Company. Tenth Census, 1880. 26177.

—— Coarse; gray. Near Saint George, Knox County. Atlantic Granite Company. Tenth Census, 1880. 26178.

—— Fine; dark gray. Near Saint George, Knox County. Clark's Island Granite Company. Tenth Census, 1880. 26212.

Biotite granite. Coarse; gray. Spruce Head Island, Knox County. **Bodwell Granite Company.** Tenth Census, 1880. 26179.

—— Coarse; gray, slightly pinkish. Fox Island, Knox County. **Harbor quarry.** Colonel Clark. 25009.

—— Fine; dark gray. Fox Island, Knox County. **East Boston quarry.** Colonel Clark. 25020.

—— Medium; dark gray. Bryant's Pond, Oxford County. Grand Trunk Railway. Tenth Census, 1880. 26269.

—— Medium; gray. Bryant's Pond, Oxford County. J. S. F. Batchen, 1883. 28647.

—— Coarse; gray. Bryant's Pond, Oxford County. Grand Trunk Railway. Tenth Census, 1880. 26270.

—— Coarse; gray. Near Wayne, Kennebec County. J. F. Gordon's quarry. Tenth Census, 1880. 26507.

—— Coarse; light gray. Franklin, Hancock County. Quarry of Blaisdell Bros. Tenth Census, 1880. 26073.

—— Medium; gray pink spotted. Somesville, Mount Desert, Hancock County. C. J. Hall's quarry. Tenth Census, 1880. 26124.

—— Medium; gray-pink spotted. Somesville, Hancock County. Quarry of Whitney & Allen. Tenth Census, 1880. 26125.

—— Coarse; light pink. Somesville, Mount Desert, Hancock County. C. J. Hall's quarry. Tenth Census, 1880. 26152.

—— Coarse; light pink. Near Somesville, Hancock County. C. J. Hall's quarry. Tenth Census, 1880. 27179.

—— Coarse; gray. Deer Isle, Hancock County. Quarry of Goss & Goss. Tenth Census, 1880. 26155.

—— Coarse; gray. East Blue Hill, Hancock County. Chase & Hall's quarry. Tenth Census, 1880. 26139.

—— Gray; porphyritic. East Blue Hill, Hancock County. Collins Granite Company. Tenth Census, 1880. 26146.

—— Coarse; gray. East Blue Hill, Hancock County. G. W. Collins & Co. Tenth Census, 1880. 26134.

—— Light gray; coarsely porphyritic. Foot cube. East Blue Hill, Hancock County. Centennial, 1876. 17470.

—— Medium; gray. West Sullivan, Hancock County. J. H. Stinson's quarry. Tenth Census, 1880. 26049.

—— Fine; light gray. Brunswick, Cumberland County. H. Cripp's quarry. Tenth Census, 1880. 26420.

—— Fine; gray. Near Pownal, Cumberland County. T. Reed's quarry. Tenth Census, 1880. 27070.

Biotite muscovite granite. Fine; very light gray. Waldoborough, Lincoln County. Quarry of Day & Otis. Tenth Census, 1880. 26326.

Biotite gneiss. Medium; gray. Jefferson, Lincoln County. J. P. Glidden's quarry. Tenth Census, 1880. 26276.

—— Medium; gray. Near Chesterville, Franklin County. J. H. Plummer's quarry. Tenth Census, 1880. 26371.

—— Medium; dark gray. Near Turner, Androscoggin County. C. H. Barrell's quarry. Tenth Census, 1880. 26508.

Muscovite biotite gneiss. Fine light gray. Lincolnville, Waldo County. Beach Grove Granite Company. Tenth Census, 1880. 26241.

Muscovite biotite gneiss. Fine; gray. Jefferson, Lincoln County. J. P. Glidden's quarry. Tenth Census, 1880. 26486.

Muscovite biotite granite. Fine; very light gray. Near Hallowell, Kennebec County. Hallowell Granite Company. Tenth Census, 1880. 26335.

—— Fine; very light gray. Near Hallowell, Kennebec County. Hallowell Granite Company. Tenth Census, 1880. 26336.

—— Fine; light gray. North Jay, Franklin County. Maine Central Railroad Company. Tenth Census, 1880. 26385.

Hornblende biotite granite. Coarse; gray. Lincoln, Penobscot County. Jewell Granite Company. Tenth Census, 1880. 27084.

—— Fine; very dark gray, nearly black. Saint George, Knox County. Long Cove Granite Company. Tenth Census, 1880. 26176.

Hornblende granite. Coarse; red; very tough and hard. Otter Creek, Hancock County. Otter Creek quarry. Tenth Census, 1880. 27178.

Talcose schist. Fine; compact; dark gray. Knightsville, Cumberland County. P. C. Manning, 1883. 28117.

Elæolite syenite.* Coarse; light gray, yellow spotted. Near Litchfield, Kennebec County. Tenth Census, 1880.

Olivine diabase. Devonian (?); medium; dark gray, nearly black on a polished surface; used for monumental work. Addison Point, Washington County. Col. Edward Clark, 1881. 25022.

—— Devonian; medium; dark gray, spotted black and white on a polished surface; known commercially as black granite, and is used largely for monumental work. Six miles southeast of Addison Point, Washington County. Pleasant River Black Granite Company. Tenth Census, 1880. 25925.

Diabase. Devonian (?); medium; dark gray, spotted black and white on a polished surface; known commercially as black granite, and is largely used for monumental work. Addison, Washington County. H. B. Nash's quarry. Tenth Census, 1880. 26072.

—— Fine and compact; very dark gray, black on a polished surface; used chiefly for monumental work. Vinal Haven, Knox County. Bodwell Granite Company. Tenth Census, 1880. 26167.

Slate. Blue-black. Monson, Piscataquis County. Quarries of Monson Pond Slate Company. Tenth Census, 1880. 25651.

—— Blue-black. Brownville, Piscataquis County. Quarry of Adams H. Merrill. Tenth Census, 1880. 25652.

—— Blue-black. Monson, Piscataquis County. Quarries of Dirigo Slate Company. 25819.

MARYLAND.

Steatite [soapstone]. Coarse; rust spotted. Bethesda, Montgomery County. C. W. Lansdale. 25016.

—— Fine and compact; dark blue-gray. On Liberty road, about 15 miles from Baltimore. Quarries of Baltimore and North Branch Soapstone Company. Tenth Census, 1880. 26628.

Serpentine. Light and dark green, streaked and mottled; fine grained and compact; takes a high polish. Five specimens; one 12¼ by 4¼ by ⅛ inches, polished on both sides; one 5 by 3¼ by 1½ inches; and three 4 inch cubes. Dublin, Harford County. Quarries of Green Serpentine Marble Company. E. Mortimer Bye, 1881. 26173.

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* The elæolite syenite is not used for building purposes, and is of doubtful utility.

Serpentine. Dark green; very fine and compact; takes a high polish. **Deer Creek,** Harford County. Deer Creek quarries. Tenth Census, 1880. 26868.

—— Light and dark green, mottled; fine and compact; takes a high polish. 6 by 6 by 3 inches. Broad Creek, Harford County. Centennial, 1876. 17514.

—— Compact; dark green; takes a high polish. 6-inch cube. Broad Creek, Harford County. Centennial, 1876. 17517.

—— Dark green; fine and compact; takes only a dull polish. Near Baltimore. G. A. Leakin, 1883. 27682.

Biotite gneiss. Coarse; gray. Port Deposit, Cecil County. Quarry of McClenahan & Bro. Tenth Census, 1880. 25359.

—— Light gray; fine and medium. Two specimens. Near Baltimore City, Baltimore County. J. Harris's quarry. Tenth Census, 1880. 25576.

—— Coarse; dark gray. Opposite Ellicott City, Baltimore County. C. J. Werner's quarry. Tenth Census, 1880. 25358.

—— Fine; light and dark gray. Two specimens. Jones Falls road, Mount Royal, Baltimore County. J. Curley's quarry. Tenth Census, 1880. 26930.

Biotite granite. Medium; gray. Near Woodstock, Baltimore County. W. F. Weller's quarry. Tenth Census, 1880. 25361.

—— Medium; gray. Near Woodstock, Baltimore County. Fox Rock quarry. Tenth Census, 1880. 25360.

—— Coarse; gray. Granite, Baltimore County. Quarry of Gill & McMahon. Tenth Census, 1880. 25403.

—— Fine; gray. Gwynn's Falls, Baltimore County. Old Winan estate. Tenth Census, 1880. 26867.

—— Fine; light gray. Montrose, Montgomery County. H. P. Dwyer's quarry. Tenth Census, 1880. 26947.

Dolomite [marble]. Lower Silurian; white; crystalline. Texas, Baltimore County. A block from the top stone of the Washington Monument. Barney Mooney, 1884. 36050.

—— Lower Silurian; white; crystalline. Cockeysville, Baltimore County. Beaver Dam Marble Company. Tenth Census. 27062.

—— Lower Silurian; white; crystalline. Cockeysville, Baltimore County. Colonel Clark, 1881. 25206.

—— Lower Silurian; white; crystalline. Cockeysville, Baltimore County. Tenth Census, 1880. 25015.

—— Lower Silurian; white; crystalline. Cockeysville, Baltimore County. Tenth Census, 1880. 25003.

Magnesian limestone [marble]. White, with purple stripes; crystalline. New Windsor, Carroll County. William N. Chew's quarry. Tenth Census. 26931.

—— Light blue-gray; crystalline. Near New Windsor, Carroll County. A. A. Roop's quarry. Tenth Census, 1880. 26807.

—— Gray; laminated. Keedysville, Washington County. John Suear's quarry. Tenth Census, 1880. 26205.

—— White; crystalline. Union Bridge, Frederick County. D. Rinehardt's quarry. Tenth Census, 1880. 26829.

—— Union Bridge, Frederick County. D. Rinehardt's quarry. Tenth Census, 1880. 26830.

Conglomerate breccia [marble]. Triassic; red, variegated. Frederick County. Slab 20 by 30 by 1¼ inches. Used in the interior decorations of the Capitol at Washington, D. C. Col. Edward Clark, 1881. 28744.

Conglomerate breccia [marble]. Triassic; coarse; red, variegated. Near Frederick, Frederick County. Gertzendanner's quarry. Tenth Census, 1880. 26797.

Siliceous limestone. Fine black. Liberty Pike, Frederick County. Hoke's quarry. Tenth Census, 1880. 25996.

Magnesian limestone. Lower Silurian; fine; dark. Hagerstown, Washington County. T. G. Jones's quarry. Tenth Census, 1880. 26055.

Biotite epidote gneiss. Fine; light red. Ilchester, Howard County. Tenth Census, 1880. 26856.

Hornblende gneiss. Fine; very dark gray, nearly black. Ilchester, Howard County. Tenth Census, 1880. 26855.

Sandstone. Fine; light drab. Seneca, Montgomery County. Tenth Census. 25013.

—— Fine; light red; used for building purposes in Washington, D. C. Seneca, Montgomery County. Tenth Census. 25016.

—— Nearly white; medium. Frederick County. J. L. Belt's quarry. Tenth Census, 1880. 25678.

—— Devonian; coarse; yellow. Cumberland, Allegany County. Shriver's quarry. Tenth Census. 26839.

—— Devonian; coarse; yellow. Cumberland, Allegany County. Green Street quarry. Tenth Census. 26840.

—— Lower Silurian; coarse; light colored. Cumberland, Allegany County. William Lippold's quarry. 26841.

Slate. Blue-black. Slab 6¼ inches square. Harford County. Quarries of Harford Peach Bottom Slate Company. Tenth Census, 1880. 25364.

—— Blue-black. Slab 6½ inches square. Harford County. Quarries of Harford Peach Bottom Slate Company. Tenth Census, 1880. 25365.

—— Blue-black. Slab 6 inches square. Harford County. Quarry of J. W. Jones & Co. Tenth Census, 1880. 25366.

—— Blue-black. Slab 6 inches square. Harford County. Quarry of T. W. Jones. Tenth Census. 25367.

—— Blue-black. Harford County. Quarries of Harford Peach Bottom Slate Company. Tenth Census, 1880. 26411.

—— Blue-black. Harford County. Quarries of Harford Peach Bottom Slate Company. Tenth Census, 1880. 26410.

—— Purple. 4 by 4 by 2 inches. Ijamsville, Frederick County. Quarries of Maryland Slate Company. Tenth Census, 1880. 26932.

—— Blue-black. Slab 8 inches square. Harford County. Quarry of W. E. Williams & Co. Tenth Census, 1880. 25362.

—— Blue-black. Slab 8 inches square. Harford County. Quarry of W. C. Roberts & Co. Tenth Census, 1880. 25363.

Bracket of carved slate. 10 by 8 inches. Harford County. Quarries of Harford Peach Bottom Slate Company. Tenth Census, 1880. 26412.

MASSACHUSETTS.

Steatite [soapstone]. Coarse; dark gray. Two miles southeast of Dana, Worcester County. Quarry of Kimball, Osgood & Co. Tenth Census, 1880. 26439.

Serpentine. Compact; very dark green, nearly black; takes but a dull polish. 6-inch cube. Essex County. 25026.

—— Compact; very light green; takes a dull polish. Newburyport, Essex County. Centennial, 1876. 26010.

—— Deep green, nearly black; fine and compact; takes but a dull polish. Lynnfield, Essex County. Quarries of Lynnfield Soapstone Company. Tenth Census, 1880. 26554.

Dolomite [marble]. Lower Silurian; pure white; crystalline. **Lee, Berkshire County.** Tenth Census, 1880. 25012.

—— Lower Silurian; white; crystalline. Lee, Berkshire County. Quarry of F. S. Gross. Tenth Census, 1880. 26070.

Magnesian limestone. Lower Silurian; gray; coarse; crystalline. Pittsfield, Berkshire County. Tenth Census. 26057.

Magnesian limestone [marble]. Lower Silurian; white; coarsely crystalline. Lee, Berkshire County. Tenth Census, 1880. 27004.

—— Lower Silurian; white; crystalline. Egremont, Berkshire County. Centennial, 1876. 17426.

—— Lower Silurian; gray; fine and compact. Stockbridge, Berkshire County. Tenth Census, 1880. 26069.

—— Lower Silurian; white; coarsely crystalline. Sheffield, Berkshire County. Quarry of Briggs & Co. Tenth Census, 1880. 26081.

Limestone [marble]. Lower Silurian; white; crystalline. Alford, Berkshire County. Centennial, 1876. 17437.

—— Lower Silurian; white; clouded. Alford, Berkshire County. H. S. Fitch's quarry. Tenth Census, 1880. 26082.

Hornblende granite. Coarse; dark gray. Two specimens. Quincy, Norfolk County. Quarry of C. H. Hardwick & Co. Tenth Census, 1880. 25609.

—— Coarse; dark gray. Quincy, Norfolk County. Quarry of Wendell & Co. Tenth Census, 1880. 25610.

—— Coarse; pinkish gray. Quincy, Norfolk County. Quarry of Wendell & Co. Tenth Census, 1880. 25611.

—— Coarse; dark gray. Quincy, Norfolk County. Quarry of Field & Wild. Tenth Census, 1880. 25616.

—— Medium; light gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17430.

—— Coarse; dark gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17432.

—— Coarse; dark gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17433.

—— Coarse; dark gray. Quincy, Norfolk County. Quarry of Barker & Sons. Tenth Census, 1880. 25606.

—— Coarse; dark gray. Two specimens. Quincy, Norfolk County. Quarry of C. H. Hardwick & Co. Tenth Census, 1880. 25608.

—— Coarse; dark gray. Quincy, Norfolk County. Quarry of McKenzie & Patterson. Tenth Census, 1880. 26973.

—— Coarse; light pinkish gray. Quincy, Norfolk County. Centennial, 1876. 26002.

—— Coarse; dark red. Quincy, Norfolk County. Quarry of H. Barker & Son. G. P. Merrill. 28554.

—— Coarse; dark pinkish gray. Polished slab 35 by 35 by 3 inches. Quincy, Norfolk County. Quarry of H. Barker & Sons. Tenth Census, 1880. 26938.

—— Coarse; dark gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17449.

—— Coarse; dark gray. Two specimens. Quincy, Norfolk County. Quarry of McKenzie & Patterson. Tenth Census, 1880. 25607.

—— Coarse; dark gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17435.

—— Coarse; dark gray. Quincy, Norfolk County. Centennial, 1876. 17436.

Hornblende granite. Coarse; dark gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17423.

—— Coarse; gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17425.

—— Coarse; dark gray. 6-inch cube. Quincy, Norfolk County. Centennial, 1876. 17427.

—— Coarse; dark gray. Quincy, Norfolk County. Centennial, 1876. 17429.

—— Coarse; gray. West Quincy, Norfolk County. Quarry of F. J. Fuller & Co. Tenth Census, 1880. 25604.

—— Coarse; dark gray. West Quincy, Norfolk County. Quarry of O. T. Rogers & Co. Tenth Census, 1880. 25605.

—— Coarse; dark gray. West Quincy, Norfolk County. C. Wilson's quarry. Tenth Census, 1880. 25617.

Epidote granite. Fine; light pink, green spotted. Dedham, Norfolk County. Bullard's quarry. Tenth Census, 1880. 26386.

— Fine; light pink, green spotted. Dedham, Norfolk County. J. Delaney's quarry. Tenth Census, 1880. 26387.

Biotite granite. Coarse; light gray, slightly pinkish. Randolph, Norfolk County. Quarry of S. B. Corliss. Tenth Census, 1880. 25594.

Muscovite gneiss. Fine; gray. Westford, Middlesex County. Quarry of B. Palmer & Sons. Tenth Census, 1880. 26456.

—— Gray; finely porphyritic. Westford, Middlesex County. S. Fletcher's quarry. Tenth Census, 1880. 26457.

—— Fine; light gray. Westford, Middlesex County. A. Fletcher's quarry. Tenth Census, 1880. 26458.

—— Fine; gray. Westford, Middlesex County. W. Reed's quarry. Tenth Census, 1880. 26460.

—— Fine; gray. Westford, Middlesex County. D. Reed's quarry. Tenth Census, 1880. 26461.

—— Fine; gray. Westford, Middlesex County. D. Reed's quarry. Tenth Census, 1880. 26462.

—— Coarse; gray. West Andover, Essex County. J. Maddox's quarry. Tenth Census, 1880. 26595.

—— Coarse; light gray. Lawrence, Essex County. J. Moulton's quarry. Tenth Census, 1880. 26547.

—— Medium; light gray. Charlton, Worcester County. Quarry of Lamson & Woodbury. Tenth Census, 1880. 25923.

—— Fine; light gray. Monson, Hampden County. Quarry of W. N. Flint & Co. Tenth Census, 1880. 25911.

Muscovite biotite gneiss. Fine; light gray. Westford, Middlesex County. Quarry of Swett & Smith. Tenth Census, 1880. 26459.

Biotite gneiss. Fine; gray; slightly pinkish. Westford, Middlesex County. W. Reed's quarry. Tenth Census, 1880. 25544.

—— Coarse; dark gray. Lowell, Middlesex County. S. L. Ward's quarry. Tenth Census, 1880. 26071.

—— Coarse; light gray. 6-inch cube. Douglass, Worcester County. Centennial, 1876. 17431.

—— Coarse; gray. Northbridge, Worcester County. Quarry of S. J. Fowler, jr. Tenth Census, 1880. 26194.

Biotite gneiss. Fine; dark gray. Monson, Hampden County. Quarry of W. N. Flint & Co., Mass. Tenth Census, 1880. 25910.

— Fine; light gray. Northfield, Franklin County. Quarry of Bassett & Lyons. Tenth Census, 1880. 25944.

Biotite granite. Coarse; light pink. Framingham, Middlesex County. J. G. Cloyse's quarry. Tenth Census, 1880. 26425.

— Coarse; light pinkish gray. Framingham, Middlesex County. J. G. Cloyse's quarry. Tenth Census, 1880. 26426.

— Coarse; gray. Framingham, Middlesex County. J. G. Cloyse's quarry. Tenth Census. 26428.

— Coarse; pinkish gray, with green blotches. North Easton, Bristol County. M. Gilbert's quarry. Tenth Census, 1880. 26918.

— Coarse; pink. North Easton, Bristol County. Quarry of Ames & Son. Tenth Census, 1880. 26821.

— Coarse; light gray. Freetown, Bristol County. Fall River Granite Company. Tenth Census, 1880. 25578.

— Coarse; light pink. Near Milford, Worcester County. Quarry of Norcross Brothers. Tenth Census, 1880. 26767.

— Coarse; light pink. Used in the construction of the new city hall at Albany, N. Y. Milford, Worcester County. J. S. Sherman's quarry. Tenth Census, 1880. 26648.

— Medium; light gray with greenish blotches. Near Milford, Worcester County. Boston and Albany Railroad Company. Tenth Census, 1880. 26505.

— Fine; dark gray. Leominster, Worcester County. S. L. Kittridge's quarry. Tenth Census, 1880. 26400.

— Fine; dark gray. Clinton, Worcester County. L. M. Allen's quarry. Tenth Census, 1880. 26399.

— Coarse; light pink. Brockton, Plymouth County. W. T. Cleaveland's quarry. Tenth Census, 1880. 25579.

Hornblende biotite (annite) granite. Coarse; light gray; slightly greenish. Gloucester, Essex County. S. P. Andrews's quarry. Tenth Census, 1880. 25500.

Hornblende granite. Coarse; gray; slightly pinkish. Gloucester, Essex County. Centennial, 1876. 25287.

— Coarse; gray. Gloucester, Essex County. Trumbull Granite Company. Tenth Census, 1880. 25501.

— Coarse; light greenish gray. Used in the construction of the Butler house on Capitol Hill, Washington, D. C. Gloucester, Essex County. Cape Ann Granite Company. Tenth Census, 1880. 26545.

— Coarse; gray. Gloucester, Essex County. Cape Ann Granite Company. Tenth Census, 1880. 26544.

— Coarse; gray. Two specimens. Gloucester, Essex County. Quarry of Barker Brothers. Tenth Census, 1880. 26553.

— Coarse; greenish gray. Gloucester, Essex County. Lanesville Granite Company. Tenth Census, 1880. 26955.

— Coarse; light greenish gray. Wyoma, Essex County. J. R. Jordan's quarry. Tenth Census, 1880. 26637.

— Coarse; greenish gray. Wyoma, Essex County. J. D. Wilson's quarry. Tenth Census, 1880. 26638.

— Coarse; dark gray. Rockport, Essex County. Lanesville Granite Company. Tenth Census, 1880. 26953.

— Coarse; gray. Rockport, Essex County. Rockport Granite Company. Tenth *Census*, 1880. 26923.

Hornblende granite. Coarse; gray. Rockport, Essex County. Pigeon Hill Granite Company. Tenth Census, 1880. 26546.

—— Coarse; greenish. Peabody, Essex County. Quarry of Putnam & Linneham. Tenth Census, 1880. 25757.

Muscovite biotite granite. Coarse; light gray. Worcester, Worcester County. G. D. Webb's quarry. Tenth Census, 1880. 26440.

Biotite muscovite granite. Coarse; light gray. Fitchburg, Worcester County. S. P. Litchfield's quarry. Tenth Census, 1880. 25862.

—— Medium; light gray. 6-inch cube. Fitchburg, Worcester County. Centennial, 1876. 17438.

—— Fine; dark gray. Becket, Berkshire County. Chester Granite Company. Tenth Census, 1880. 26107.

—— Fine; gray. Becket. Berkshire County. Quarry of McClellan & Goodwin. Tenth Census, 1880. 26108.

Granite. Coarse; light pinkish, with green blotches. Wood's Holl, Barnstable County. U. S. Fish Commission. 26885.

Quartz porphyry. Dark red, with pink spots; fine and compact. Slab 4 by 6 inches. Hingham, Plymouth County. George P. Merrill, 1884. 35943.

This is a most beautiful and durable stone, but is at present scarcely at all used on account of its hardness.

Diabase. Coarse; dark gray. Used for pavements and the rough work of foundations. Medford, Middlesex County. Medford quarry. Tenth Census, 1880. 26422.

—— Coarse; dark gray. Used for pavements and the rough work of foundations. Medford, Middlesex County. Medford quarry. Tenth Census, 1880. 26424.

—— Coarse; light gray, with pink spots. Used for pavements, building, and monumental work. Somerville, Middlesex County. E. Fitzgerald's quarry. Tenth Census, 1880. 26549.

—— Coarse; light gray, with pink spots. Used for pavements, building, and monumental work. Somerville, Middlesex County. E. Fitzgerald's quarry. Tenth Census, 1880. 26550.

—— Mesozoic; dark greenish gray; fine and compact. Used chiefly for street pavements. East Long Meadow, Hampden County. Centennial, 1876. 17446.

Melaphyr. Compact; amygdaloidal; dark green, with rounded and oval spots of light green and white. Used for foundations and rough construction. Brighton, Suffolk County. Quarry of S. W. Brown, jr. Tenth Census. 26552.

Sandstone. Triassic; fine; brown. Used extensively for general building and trimming purposes. East Long Meadow, Hampden County. Centennial, 1876. 17440.

—— Triassic; fine; brown. Used as above. East Long Meadow, Hampden County. Centennial, 1876. 17443.

—— Triassic; fine; brown. East Long Meadow, Hampden County. Centennial, 1876. 17444.

—— Triassic; fine; light brown. Long Meadow, Hampden County. Centennial, 1876. 17445.

Conglomerate. Coarse; greenish; very compact. Used for general building purposes. Dorchester, Suffolk County. Owen Nason's quarry. Tenth Census, 1880. 26746.

MICHIGAN.

Limestone. Devonian; drab; fossiliferous. Sibley's Station, Wayne County. F. Sibley's quarry. Tenth Census, 1880. 26206.

Limestone. Devonian; gray. Near Raisinville, Monroe County. Fritz Rath's quarry. Tenth Census, 18-0. 26207.

Granite. Fine; light red. Near Vulcan, Menominee County. F. L. Lasier's quarry. Tenth Census, 1880. 27343.

Biotite gneiss. Coarse; gray. Near Vulcan, Menominee County. F. L. Lasier's quarry. Tenth Census, 1880. 27345.

Sandstone. Potsdam; light brown gray spotted; medium. Marquette, Marquette County. Centennial 1876. 18927.

—— Potsdam; fine; reddish brown. Marquette, Marquette County. Watson & Palmer's quarry. John S. F. Batchen. 27510.

—— Potsdam; dark brown; medium. Marquette, Marquette County. Quarry of Wolf, Jacobs & Co. John S. F. Batchen. 28501.

—— Potsdam; fine; brown and reddish brown. Two specimens. Near L'Anse,

—— Houghton County. L'Anse Brownstone Company. John S. F. Batchen. 27356.

—— Potsdam; brown with gray bands; medium. L'Anse, Houghton County. L'Anse Brownstone Company. John S. F. Batchen. 27528.

—— Potsdam. Brown with gray spots; medium. Near L'Anse, Houghton County. L'Anse Brownstone Company. John S. F. Batchen. 27522.

—— Sub-Carboniferous; fine; light yellowish brown. Stoney Point, Jackson County. Michigan Stone Company. John S. F. Batchen. 28500.

—— Potsdam; fine; red. Portage entry, Baraga County. Portage Entry quarry. John S. F. Batchen. 28655.

—— Potsdam; fine; reddish brown. Isle Royale, Lake Superior. John S. F. Batchen. 34992.

Quartzite. Light-colored; fine and compact. Two specimens, 18 by 9 by 7 inches and 4 inch cube. Near Vulcan, Menominee County. F. L. Lasier's quarry. Tenth Census, 1880. 27344.

Slate. Blue black. Slab 8 inches square. Huron Bay. Centennial 1876. 26036.

—— Blue black. Arvon, Baraga County. Clinton quarry. J. S. F. Batchen, 1883. 27342.

MINNESOTA.

Dolomite. Lower Silurian; coarse; drab; vesicular. Stillwater, Washington County. Quarry of Hersey, Staples & Hall. Tenth Census, 1880. 26644.

—— Lower Silurian; light buff; fine; compact. Stillwater, Washington County. Quarry of Hersey, Staples & Hall. Tenth Census, 1880. 26646.

—— Lower Silurian; light-colored; finely vesicular. Two specimens. Frontenac, Goodhue County. Quarry of Fostevin & Co. Tenth Census, 1880. 26755.

—— Lower Silurian; light-colored; vesicular. Red Wing, Goodhue County. G. A. Carlson's quarry. Tenth Census, 1880. 26754.

—— Lower Silurian; light-colored; coarse; vesicular. Red Wing, Goodhue County. R. L. Berghind's quarry. Tenth Census, 1880. 25725.

—— Lower Silurian; fine; reddish. Kasota, Le Sueur County. Quarry of Breen, Young & Co. Tenth Census, 1880. 25965.

—— Lower Silurian; fine; light buff. Kasota, Le Sueur County. J. W. Babcock's quarry. Tenth Census, 1880. 25904.

—— Lower Silurian; coarse; buff. Two specimens. Mankato, Blue Earth County. O. R. Mather's quarry. Tenth Census, 1880. 25821.

—— Lower Silurian; drab; compact. Winona, Winona County. C. M. Porter's quarry. Tenth Census, 1880. 26732.

Siliceous dolomite. Lower Silurian; light drab; vesicular. Stillwater, Washington County. Quarry of Hersey, Staples & Hall. Tenth Census, 1880. 26645.

—— Lower Silurian; gray; fossiliferous. Minneapolis, Hennepin County. Quarry of Foley & Herbert. Tenth Census, 1880. 25825.

—— Lower Silurian; gray; finely fossiliferous; compact. Clinton Falls, Steele County. Quarry of Lindersmith & Son. Tenth Census, 1880. 26758.

—— Lower Silurian; light-colored; cellular. Mantorville, Dodge County. Quarry of Hook, Mantor & Dorg. Tenth Census, 1880. 26689.

Magnesian limestone. Lower Silurian; gray; fossiliferous. Saint Paul, Ramsey County. Quarry of Breen & Young. Tenth Census, 1880. 26288.

—— Lower Silurian; gray; fossiliferous. Minneapolis, Hennepin County. A. Dahl's quarry. Tenth Census, 1880. 25871.

—— Lower Silurian; very light drab; fine; compact; dedritic. Red Wing, Goodhue County. W. W. Sweeney's quarry. Tenth Census, 1880. 26724.

Siliceous magnesian limestone. Lower Silurian; gray; fossiliferous. Saint Paul, Ramsey County. W. Dawson's quarry. Tenth Census, 1880. 26743.

—— Lower Silurian; drab; coarsely fossiliferous. Minneapolis, Hennepin County. Jas. Baxter's quarry. Tenth Census, 1880. 25831.

Limestone. Lower Silurian: gray; fossiliferous. Two specimens. Minneapolis, Hennepin County. W. W. Eastman's quarry. Tenth Census, 1880. 25824.

—— Lower Silurian; gray; finely fossiliferous; compact. Cañon City, Rice County. Philip Cromer's quarry. Tenth Census, 1880. 26757.

—— Lower Silurian; pinkish. Near Kasota, Le Sueur County. J. S. F. Batchen, 1884. 34994.

Calcareous dolomite. Lower Silurian; gray; finely fossiliferous; compact. Cañon City, Rice County. Philip Cromer's quarry. Tenth Census, 1880. 26756.

Hornblende granite. Coarse; dull red. East Saint Cloud, Sherburne County. Quarry of Breen & Young. Tenth Census, 1880. 26289.

—— Coarse; gray. East Saint Cloud, Sherburne County. Quarry of Breen & Young. Tenth Census, 1880. 26290.

—— Medium; gray. East Saint Cloud, Sherburne County. Quarry of Breen & Young. Tenth Census, 1880. 25964.

—— Medium; gray. Sauk Rapids, Benton County. G. S. Reader's quarry. Tenth Census, 1880. 25743.

Granite. Coarse; red. Four miles below Beaver Bay, Lake County. Tenth Census, 1880. 26518.

—— Medium; dull red. Beaver Bay, Lake County. Quarry of Wieland Bros. Tenth Census, 1880. 26633.

Hornblende mica granite. Coarse; gray. Watab, Benton County. Quarry of Saulpaugh & Bros. Tenth Census, 1880. 25822.

—— Coarse; dull red. Watab, Benton County. Centennial, 1876. 26000.

—— Coarse; red. 14 by 11 by 9. Watab, Benton County. H. D. Gurney, 1885. 37605.

—— Coarse; dull red. Watab, Benton County. Quarry of Saulpaugh & Bros. Tenth Census, 1880. 25823.

Quartz porphyry. Reddish brown. Baptism River, Lake County. Tenth Census, 1880. 26629.

—— Dark reddish brown. Duluth, Saint Louis County. Tenth Census, 1880. 26438.

Diabase. Nearly black; very fine and compact. Duluth, Saint Louis County. Tenth Census, 1880. 26442.

Diabase. Nearly black; very fine and compact. Used for foundations and rough construction. Near Duluth, Saint Louis County. United States Government Survey. Tenth Census, 1880. 26567.

—— Nearly black; fine and compact. Two Harbor Bay, Lake Superior, Lake County. Tenth Census, 1880. 26634.

Gabbro. Coarse; dark gray. Used for house trimmings and general building. Duluth, Saint Louis County. Tenth Census, 1880. 26443.

This stone is commercially known as *Duluth granite.*

Massive labradorite. Coarse; compact; light greenish. Three miles East of Beaver Bay, Lake County. Tenth Census, 1880. 26571.

Olivine diabase. Lower Silurian; nearly black; fine and compact. Used for foundations and rough construction. Taylor's Falls, Chisago County. Tenth Census, 1880. 26591.

Sandstone. Lower Silurian; fine; brown with light spots. Fond du Lac, Saint Louis County. J. G. McDonald's quarry. Tenth Census, 1880. Two specimens. 26446.

—— Lower Silurian; fine; brown with light spots. Fond du Lac, Saint Louis County. M. Boyles quarry. Tenth Census. 26447.

—— Lower Silurian; fine; very light colored. Hinckley, Pine County. Saint Paul and Duluth Railroad. Tenth Census. 26636.

—— Lower Silurian; fine and friable; light-colored with ferruginous blotches. Jordan, Scott County. Phillip Kipp's quarry. Tenth Census. 26686.

—— Lower Silurian; fine, friable; very light buff with ferruginous blotches. Jordan, Scott County. Phillip Kipp's quarry. Tenth Census. 26687.

—— Lower Silurian; light-colored; fine and friable. Dakota, Winona County. Quarry of Brown & Hartley. Tenth Census. 26723.

—— Lower Silurian; gray; fine and friable. Dresbach, Winona County. Quarry of J. F. Fostevin, jr. 26827.

—— Purplish brown; medium. Luverne, Rock County. John S. F. Batchen. 27407.

—— Lower Silurian; fine; yellow. Mendota, Dakota County. Quarry of Steele & McIntyre. Tenth Census. 26772.

Quartzite. Potsdam; maroon; fine and compact. Courtland, Nicollet County. Fritz Meyerding's quarry. Tenth Census. 26688.

Slate. Greenish. 4 by 4 by 1 inches. Near Knife Falls, Carlton County. Saint Paul and Duluth Railroad. Tenth Census, 1880. 26488.

MISSISSIPPI.

Limestone. Gray; finely fossiliferous; compact. Tishomingo County, 1885. 37580.

Sandstone. Very light yellow; fine; cellular. Tishomingo County. 37581.

—— Light colored; soft and friable. Tishomingo County. 37599.

—— Light colored; medium. Foot cube. Stonington, Jefferson County. 37820.

Sandstone, argillaceous. Fine; yellow. Rankin County. 37598.

MISSOURI.

Magnesian limestone [marble]. Red; white spotted. Slab 7 by 5 by 1 inches. Iron County. Centennial, 1876. 27123.

—— Dull red; variegated. Sec. 36, T. 33, R. 52, Madison County. Cedar Creek quarry. Tenth Census, 1880. 26607.

Limestone. Sub-Carboniferous; drab; fine and compact. Saint Louis, Quarry of Schranka & Veith. Tenth Census, 1880. 26701.

Limestone. Sub-Carboniferous; drab; finely fossiliferous. Saint Louis. Quarry of Bambrick & Morihan. Tenth Census, 1880. 26713.

—— Sub-Carboniferous; light gray; fine and compact. Saint Louis. John McKenna's quarry. Tenth Census, 1880. 26714.

—— Sub-Carboniferous; drab; fine and compact. Near Saint Louis, Saint Louis County. George Redemeyer's quarry. Tenth Census, 1880. 26716.

—— Sub-Carboniferous; drab; fine; compact; semi-crystalline. Near Saint Louis, Saint Louis County. George Redemeyer's quarry. Tenth Census, 1880. 26717.

—— Sub-Carboniferous; drab; fine-grained; compact; fossiliferous. Saint Louis, Saint Louis County. Diederich Scharinghaus's quarry. Tenth Census, 1880. 26718.

—— Sub-Carboniferous; light colored; fine-grained; compact. Saint Louis. J. O'Meara's quarry. Tenth Census, 1880. 26722.

—— Light colored; semi-crystalline; fossiliferous. Near Glencoe, Saint Louis County. Glencoe Lime Company. Tenth Census, 1880. 26303.

—— Sub-Carboniferions; light colored; semi-crystalline; fossiliferous. Near Glencoe, Saint Louis County. Oliver's quarry. Tenth Census, 1880. 26304.

—— Coarse; buff; fossiliferous. Glencoe Branch, Saint Louis County. Oliver's quarry. Tenth Census, 1880. 26773.

—— Sub-Carboniferous; light colored; finely fossiliferous. Barrett's Station, Saint Louis County. J. Bambrick's quarry. J. S. F. Batchen, 1884. 35698.

—— Sub-Carboniferious; dark; fine and compact. Boonville, Cooper County. Russell's quarry. Tenth Census, 1880. 25679.

—— Gray; finely fossiliferous. Carthage, Jasper County. Lime quarry. Tenth Census, 1880. 26564.

—— Carboniferous; dark buff mottled; fossil-bearing. Kansas City, Jackson County. James Dowling's quarry. Tenth Census, 1880. 25393.

—— Light colored; fine-grained; compact. Carthage, Jasper County. Railroad Bridge quarry. Tenth Census, 1880. 26565.

—— Sub-Carboniferous; light gray; fossiliferous. Springfield, Greene County. Leftwick's quarry. Tenth Census, 1880. 26561.

—— Sub-Carboniferous; light gray; fossiliferous. Springfield, Greene County. J. S. Phelps's quarry. Tenth Census, 1880. 26563.

—— Dark; compact; fossiliferous. Neosho, Newton County. Ratliffe quarry. Tenth Census, 1880. 26657.

—— Nearly white; crystalline; fossiliferous. Hannibal, Marion County. "City" quarry. Tenth Census, 1880. 26219.

—— Nearly white; crystalline; fossiliferous. Bear Creek, Marion County. Hannibal, Lime County. Tenth Census, 1880. 26224.

—— Potsdam; pinkish; fine and compact; takes a good polish. Near Ironton, Iron County. Rasnick's quarry. Tenth Census, 1880. 26342.

—— Drab; compact; fossil-bearing. Near New London, Ralls County. Brachears's quarry. Tenth Census, 1880. 26227.

—— Carboniferous; light colored; fine-grained. Pleasant Hill, Cass County. Parker's quarry. Tenth Census, 1880. 26810.

—— Carboniferous; drab; fine-grained; compact. Pleasant Hill, Cass County. Parker's quarry. Tenth Census, 1880. 26811.

—— Carboniferous; dark drab; fossiliferous. Near Pleasant Hill, Cass County. Cooley's quarry. Tenth Census, 1880. 26813.

Limestone. Light brown; compact; finely fossiliferous. Near Amazonia, Andrew County. Zimmerman's quarry. Tenth Census, 1880. 25600.

—— Drab; fine and compact. Saint Joseph, Buchanan County. Burnes's quarry. Tenth Census, 1880. 26247.

—— Gray; compact; fossiliferous. Paris, Monroe County. Robinson's quarry. Tenth Census, 1880. 26225.

—— Lower Silurian; nearly white; compact; crystalline. Two specimens. Cape Girardeau, Cape Girardeau County. M. Dettlinger's quarry. Tenth Census, 1880. 26328.

Dolomite. Sub-Carboniferous; light colored; fine-grained. Saint Louis. Gottlieb Eyermann's quarry. Tenth Census, 1880. 26715.

—— Sub-Carboniferous; drab; fine and compact. Saint Louis, Saint Louis County. D. Cavenaugh's quarry. Tenth Census, 1880. 26721.

—— Sub-Carboniferous; drab; fine and compact. City of Saint Louis, Saint Louis County. Quarry of A. O. Englemann & Co. Tenth Census, 1880. 26700.

—— Lower Silurian; light colored; coarsely vesicular. Jefferson City, Cole County. H. W. Holkmeyer's quarry. Tenth Census, 1880. 25656.

—— Sub-Carboniferous; bluish, drab, and buff; fine-grained; compact. Two specimens. Near Boonville, Cooper County. Stagner's quarry. Tenth Census, 1880. 25658.

—— Sub-Carboniferous; yellowish brown; compact; finely fossiliferous. Sedalia, Pettis County. Richard Anderson's quarry. Tenth Census, 1880. 25653.

—— Carboniferous; light colored; fine; dendritic. Sec. 2, T. 42, R. 24, Henry County. Quarry on Grand River. Tenth Census, 1880. 25695.

—— Buff; fine-grained. Near Ironton, Iron County. Grayson's quarry. Tenth Census, 1880. 26322.

—— Light drab; granular. Canton, Lewis County. Canton Stone Company. Tenth Census, 1880. 26361.

—— Very light drab; fine and compact. Dutzow, Warren County. J. H. Schweissguth's quarry. Tenth Census, 1880. 26935.

Siliceous dolomite. Lower Silurian; light colored; fine-grained; compact. Jefferson City, Cole County. H. W. Holkmeyer's quarry. Tenth Census, 1880. 25655.

—— Sub-Carboniferous; drab; fine-grained; compact. Near Sedalia, Pettis County. Balmer's quarry. Tenth Census, 1880. 25654.

—— Light colored; rust-spotted; fine and compact. Jones's Station, Ralls County. Jones's quarry. Tenth Census, 1880. 26221.

—— Silurian; light drab; mottled; fine-grained; compact. Near Bowling Green, Pike County. McElroy's quarry. Tenth Census, 1880. Two specimens. 26226.

—— Niagara; light colored; fine; compact. Near Bowling Green, Pike County. Jacob Speer's quarry. Tenth Census, 1880. 26228.

—— Carboniferous; drab; fine-grained. Near Pleasant Hill, Cass County. Powell's quarry. Tenth Census, 1880. 26812.

—— Light colored; fine compact. Near Marshfield, Webster County. Mark Hubble's quarry. Tenth Census, 1880. 26655.

—— Light colored; fine and compact. Stoutland, Camden County. From cut on railroad. Tenth Census, 1880. 26659.

—— Light drab; fine-grained and compact. Near Hermann, Gasconade County. Quarry of J. C. Grass. Tenth Census, 1880. 25958.

Siliceous dolomite. Light colored; fine-grained; compact. Near De Soto, Jefferson County. Donnelly's quarry. Tenth Census, 1880. 26314.

—— Dark spotted; coarse; vesicular. Near Osage, Osage County. Osage quarry. Tenth Census, 1880. 25657.

Magnesian limestone. Sub-Carboniferous; dark, with large light spots; fine-grained. Sedalia, Pettis County. Richard Anderson's quarry. Tenth Census, 1880. 25653.

—— Carboniferous; light colored; coarsely oolitic. Near Kansas City, Jackson County. J. Bauman's quarry. Tenth Census, 1880. 25394.

—— Dark spotted; fine and compact. Neosho, Newton County. Karnes's quarry. Tenth Census, 1880. 26658.

—— Buff; compact; fossiliferous. Hannibal, Marion County. City quarry. Tenth Census, 1880. 26220.

—— Potsdam; red with white spots; fine and compact; takes a good polish. Near Fredericktown, Madison County. Tenth Census, 1880. 26403.

Argillaceous limestone. Carboniferous; light colored and blue; fine and compact. Two specimens. Near Clinton, Henry County. C. B. Jordan's quarry. Tenth Census, 1880. 25696.

Lithographic limestone. Sub-Carboniferous; drab; fine-grained; compact. Saverton, Ralls County. Eureka Quarry Company. J. S. F. Batchen, 1883. 28498.

Ferruginous limestone. Drab; compact; finely fossiliferous. Near Forest City, Holt County. John Pollack's quarry. Tenth Census, 1880. 25559.

Granite. Coarse; light red. Six-inch cube. Granitesville, Iron County. W. Warren's quarry. Centennial, 1876. 25025.

—— Coarse; red. Iron Township, Iron County. Centennial, 1876. 17498.

—— Coarse; light red. Three and a half miles south of Iron Mountain, Iron County Breman's quarry. Tenth Census, 1880. 26321.

—— Coarse; pinkish gray. Silver Mountain, Madison County. Einstein's quarry. Tenth Census, 1880. 26594.

Biotite granite. Coarse; light red. Granitesville, Iron County. Syenite Granite Company. F. W. Mott, 1883. 27455.

—— Coarse; reddish gray. Syenite, Saint François County. Syenite Granite Company. F. W. Mott, 1883. 27456.

NOTE.—The Missouri granites, as a rule, contain only traces of hornblende or mica.

Hornblende granite. Medium; gray. Six-inch cube. Knob Lick, Saint François County. Centennial, 1876. 25068.

—— Medium; gray. Six-inch cube. Knob Lick, Saint François County. 25066.

Olivine diabase. Medium; dark gray. West foot of Tom Luck Mountain, Iron County. Ferguson's quarry. Tenth Census, 1880. 26333.

Calcareous sandstone. Carboniferous; light gray; medium. Warrensburgh, Johnson County. Quarry of Pickle & Bro. Tenth Census. 26936.

—— Carboniferous; gray; medium. Near Warrensburgh, Johnson County. Quarry of Pickle & Bros. 25395.

—— Bright red; micaceous. Two specimens. Rockville, Bates County. Quarry of Henry Brown & Co. Tenth Census. 26862.

—— Carboniferous; fine; gray. Near Miami Station, Carroll County. White Rock Quarry Company. Tenth Census. 26306.

—— Fine; light colored. Near Meadville, Linn County. J. Fruin's quarry. Tenth Census. 26322.

Sandstone. Fine; very light brown. Rockville, Bates County. Tenth Census. 25688.

—— Gray; rust-spotted; micaceous. Near Butler, Bates County. Curry's quarry. 25742.

—— Carboniferous; fine; light gray. Clinton, Henry County. Tenth Census. 25697.

—— Carboniferous; fine; very light brown. Clinton, Henry County. Tenth Census. 25698.

—— Carboniferous; fine; very light buff. Clinton, Henry County. George Hapgood's quarry. Centennial, 1876. 27105.

—— Brown; porous and friable. Higginsville, La Fayette County. Peter Brand's quarry. Tenth Census. 26286.

—— Light colored; porous and friable. Near Brownsville, Pettis County. Collins's quarry. Tenth Census. 26287.

—— Brown; rust-spotted; porous and friable. Keytesville, Chariton County. Bartz quarry. Tenth Census. 26305.

—— Coarse; yellow. Near Lamar, Barton County. Jesse Bollinger's quarry. Tenth Census. 26562.

—— Sub-Carboniferous; fine; very light buff. Near Saint Genevieve County. Benjamin Richardson's quarry. Tenth Census. 26685.

—— Fine; light colored. Bluff on Arrow Rock road, Howard County. R. T. Kingsbury's quarry. Tenth Census. 26223.

—— Light colored; nearly white. Jones Station, Ralls County. Jones's quarry. Tenth Census. 26229.

—— Fine; light colored; rust-spotted. Nevada, Vernon County. City of Nevada quarry. Tenth Census. 25699.

Quartzite. Fine; gray. West Foot of Tom Luck Mountain, Iron County. Fergusson's quarry. Tenth Census, 1880. 26333.

MONTANA.

Limestone [marble]. White, dark spotted; crystalline. Lewis and Clarke County. Centennial, 1876. 27088.

Dolomite (?) [marble]. Dark blue-gray, with veins of dull yellow; fine; compact. Helena, Lewis and Clarke County. Centennial, 1876. 27089.

—— Gray; brecciated. Helena, Lewis and Clarke County. Centennial, 1876. 27090.

Hornblende mica granite. Medium; light gray. Lewis and Clarke County. George McBurney, 1882. 27087.

—— Coarse; greenish gray. Butte, Deer Lodge County. George P. Merrill, 1886. 38565.

NEBRASKA.

Limestone, argillaceous. Permian; light colored; fine and compact. Roca, Lancaster County. Quarry of Keys & Bullock. Tenth Census, 1880. 27204.

Limestone. Permian; light colored; finely fossiliferous. Roca, Lancaster County. Quarry of Keys & Bullock. Tenth Census, 1880. 27202.

—— Permian; light colored; compact; finely fossiliferous. Roca, Lancaster County. Quarry of Keys & Bullock. Tenth Census, 1880. 27203.

—— Permian; light colored; fusulina. Syracuse, Otoe County. Tenth Census, 1880. 27321.

Limestone. Permian (?); light colored; fusulina. Near Glen Rock, Nemaha County. Quarry of Keys & Bullock. Tenth Census, 1880. 27201.

—— Permian; light colored; fusulina. La Platte, Sarpy County. William A. Guire's quarry. Tenth Census, 1880. 27322.

NEVADA.

Quartz porphyry. Very dark red with pink porphyritic feldspars. 3 by 3 by 1½ inches. Near Great Bend of Carson River. J. C. Russell, U. S. Geol. Survey. 35304.

Hornblende andesite. Coarse; gray. Used for purposes of rough construction. Three miles east of Virginia City, Storey County. J. Barrett's quarry. Tenth Census, 1880. 25746.

—— Coarse; porphyritic; light brown spotted with white. Used as above. Three miles east of Virginia City, Storey County. J. Barrett's quarry. Tenth Census, 1880. 25747.

—— Medium; light gray. Used as above. Two miles west of Reno, Washoe County. Fulton's quarry. Tenth Census, 1880. 25708.

Sandstone. Coarse; gray. Carson City, Oromsby County. Carson quarry. Tenth Census. 25709.

NEW HAMPSHIRE.

Steatite [soapstone]. Coarse; compact; dark gray. Francestown. Centennial, 1876. 10774.

Biotite muscovite granite. Fine; gray. Concord, Merrimack County. Quarry of Fuller & Pressey. Tenth Census, 1880. 25225.

—— Fine; gray. Concord, Merrimack County. Quarry of Hadley & Hoyt. Tenth Census, 1880. 25226.

—— Medium; gray. Concord, Merrimack County. Quarry of Donagan & Davis. Tenth Census, 1880. 26946.

—— Medium; light gray. Concord, Merrimack County. A. Hollis's quarry. Tenth Census, 1880. 27081.

—— Fine; gray. Concord, Merrimack County. M. H. Johnson's quarry. Tenth Census, 1880. 26945.

—— Fine; gray. Concord, Merrimack County. Centennial, 1876. 17486.

—— Fine; light gray. Concord, Merrimack County. Concord Granite Company. Tenth Census, 1880. 25859.

—— Fine; light gray. Concord, Merrimack County. Granite Railway Company. Tenth Census, 1880. 25649.

—— Fine; gray. Concord, Merrimack County. F. Hodgman's quarry. Tenth Census, 1880. 25223.

—— Fine; light gray. Foot cube. Concord, Merrimack County. Centennial, 1876. 25043.

—— Medium; gray. West Concord, Merrimack County. Quarry of Crowley & Quinn. Tenth Census, 1880. 25766.

—— Fine; light gray. West Concord, Merrimack County. Quarry of Putney & Nutting. Tenth Census, 1880. 25222.

—— Fine; light gray. West Concord, Merrimack County. G. A. Bosworth's quarry. Tenth Census, 1880. 25224.

—— Medium; light gray. Allenstown, Merrimack County. C. A. Bailey's quarry. Tenth Census, 1880. 25871.

—— Fine; light gray. Fitzwilliam, Cheshire County. D. H. Reed's quarry. Tenth Census, 1880. 26120.

Biotite muscovite granite. Fine; light gray. Fitzwilliam, Cheshire County. J. E. Fisher's quarry. Tenth Census, 1880. 25273.

—— Medium; gray; indistinctly porphyritic. Fitzwilliam, Cheshire County. M. Wilson's quarry. Tenth Census, 1880. 26119.

—— Fine; gray. Marlborough, Cheshire County. Centennial, 1876. 17485.

—— Fine; light gray. Marlborough, Cheshire County. Tenth Census, 1880. 25238.

—— Fine; gray. Troy, Cheshire County. Centennial, 1876. 17487.

—— Fine; light gray. Troy, Cheshire County. Tenth Census, 1880. 25428.

—— Fine; light gray. Troy, Cheshire County. L. Whitmore's quarry. Tenth Census, 1880. 25429.

—— Coarse; light pink. Manchester, Hillsborough County. W. S. Locke's quarry. Tenth Census, 1880. 26168.

—— Medium; gray. Rumney, Grafton County. G. D. Kenaston's quarry. Tenth Census, 1880. 26174.

—— Fine; light gray. Sunapee, Sullivan County. C. E. Boyce's quarry. Tenth Census, 1880. 26421.

—— Fine; light gray. Farmington, Strafford County. Richardson's quarry. Tenth Census, 1880. 26864.

Biotite granite. Fine; light and dark gray. Two specimens. Fitzwilliam Depot, Cheshire County. R. L. Augier's quarry. Tenth Census, 1880. 25405.

—— Fine; dark gray. Fitzwilliam, Cheshire County. Centennial, 1876. 17488.

—— Fine; gray. Fitzwilliam, Cheshire County. E. Blodgett's quarry. Tenth Census, 1880. 25835.

—— Fine; gray. Manchester, Hillsborough County. Quarry of A. Bodwell & Son. Tenth Census, 1880. 25860.

—— Fine; light gray. Manchester, Hillsborough County. H. Willey's quarry. Centennial, 1876. 25221.

—— Fine; light gray. Manchester, Hillsborough County. Amoskeag County quarry. Centennial, 1876. 25220.

—— Medium; light gray. Mason, Hillsborough County. J. Maxwell's quarry. Tenth Census, 1880. 25235.

—— Fine; light gray. Mason, Hillsborough County. W. Braman's quarry. Tenth Census, 1880. 25236.

—— Medium; gray. 6-inch cube. Mason, Hillsborough County. Centennial, 1876. 17424.

—— Medium; light gray. Mason, Hillsborough County. A. McDonald's quarry. Tenth Census, 1880. 25486.

—— Fine; light gray. Milford, Hillsborough County. G. F. Parker's quarry. Tenth Census, 1880. 27082.

—— Medium; light gray. Milford, Hillsborough County. N. Merrill's quarry. Tenth Census, 1880. 25234.

—— Fine; gray. Milford, Hillsborough County. K. Carlton's quarry. Tenth Census, 1880. 25230.

—— Medium; light gray. Milford, Hillsborough County. T. King's quarry. Tenth Census, 1880. 25232.

—— Fine; gray. Milford, Hillsborough County. E. Hutchinson's quarry. Tenth Census, 1880. 25233.

—— Fine; light gray. Enfield, Grafton County. Quarry of P. H. Freets & Son. 25765.

Biotite granite. Coarse; light gray. Enfield, Grafton County. D. L. Tilton's quarry. Tenth Census, 1880. 25489.

—— Medium; gray. Plymouth, Grafton County. Blair's quarry. Tenth Census, 1880. 25861.

—— Coarse; gray. Durham, Stafford County. J. S. Abbott's quarry. Tenth Census, 1880. 26246.

—— Medium; pinkish gray. Raymond, Rockingham County. Quarry of A. F. Keyes. Tenth Census, 1880. 26175.

Muscovite biotite gneiss. Fine; light gray, with garnets. Roxbury, Cheshire County. Keene Granite Company. Tenth Census, 1880. 26158.

—— Fine; very light gray. Roxbury, Cheshire County. Quarry of Nourse & Dean. Tenth Census, 1880. 26159.

—— Fine; gray. Peterborough, Hillsborough County. Peterborough Granite Works. Tenth Census, 1880. 25229.

—— Medium; gray. Fitzwilliam, Cheshire County. A. Hayden's quarry. Tenth Census, 1880. 26127.

Biotite epidote gneiss. Coarse; pink, green-spotted. Lebanon, Grafton County. C. Freeman's quarry. Tenth Census, 1880. 25487.

—— Coarse; light pink with green spots. Lebanon, Grafton County. Quarry of P. H. Freets & Son. Tenth Census, 1880. 25764.

Biotite gneiss. Medium; dark gray. Sunapee, Sullivan County. C. E. Boyce's quarry. Tenth Census, 1880. 26422.

Porphyry conglomerate [quartz porphyry]. Jasper-red; hard and compact. Two specimens. One 4-inch cube. One polished slab about 13¼ by 11 by 2 inches. Franconia, Grafton County. Tenth Census, 1880. 25523.

NEW JERSEY.

Serpentine [ophiolite]. Blue-gray, with green spots. Near Montville, Morris County. J. J. Gordon's quarry. Tenth Census, 1880. 26588.

Limestone [marble]. Pink and white; coarsely crystalline; with large crystals of pyroxene). Near Danville, Warren County. Rose Crystal Marble Company. Tenth Census, 1880. 26679.

Dolomite. Lower Silurian; dark blue-gray; crystalline; fine; compact. Newton, Sussex County. Newton quarries. Tenth Census, 1880. 26943.

Gneiss. Medium; greenish gray. Bloomingdale, Passaic County. M. J. Ryerson's quarry. Tenth Census, 1880. 26844.

—— Medium; greenish gray. Dover, Morris County. Delaware, Lackawanna and Western Railroad Company. Tenth Census, 1880. 27051.

Biotite gneiss. Coarse; pink. Near Charlottenburgh, Passaic County. M. J. Ryerson's quarry. Tenth Census, 1880. 26845.

Hornblende granite (?) Coarse; gray. Near Morristown, Morris County. Tenth Census, 1880. 26956.

Diabase. Mesozoic dark-gray; fine and compact. Used for street pavements and general building. Jersey City, Hudson County. J. Kelton's quarry. Tenth Census, 1880. 26198.

—— Mesozoic; dark gray; fine and compact. Used mostly for street pavements. Weehawken, Hudson County. M. Moore's quarry. Tenth Census, 1880. 26199.

—— Mesozoic; medium; gray. West New York, Hudson County. Used chiefly for street pavements and road ballast. D. Heft's quarry. Tenth Census, 1880. 26200.

Diabase. Mesozoic; fine; dark gray. Lambertville, Hunterdon County. Used as above. G. Bancroft's quarry. Tenth Census, 1880. 26771.

—— Mesozoic; medium; gray. Rock Church, Hunterdon County. Used as above. J. H. Murphy's quarry. Tenth Census, 1880. 26971.

—— Mesozoic; very fine; dark gray. Rocky Hill, Somerset County. Used as above. J. R. Howell's quarry. Tenth Census, 1880. 26843.

Sandstone. Triassic; fine; brown. Two specimens. Belleville, Essex County. J. B. I. Robinson's quarry. Tenth Census. 26251.

—— Triassic; medium; brown. Belleville, Essex County. Quarry of William J. Joyce. Tenth Census. 26256.

—— Triassic; fine; brown. Two specimens. Bellville, Essex County. Quarry of William J. Joyce. Tenth Census. 26257.

—— Triassic; fine; brown. Belleville, Essex County. Quarry of A. Philip & Son. Tenth Census. 26258.

—— Triassic; fine; brown. Bellville, Essex County. Quarry of A. Philip & Son. Tenth Census. 26259.

—— Triassic; fine; brown. Belleville, Essex County. Quarry of A. Philip & Son. Tenth Census. 26260.

—— Triassic; medium; brown. Belleville, Essex County. J. B. I. Robinson's Quarry. Tenth Census. 26252.

—— Triassic; medium; brown. Newark, Essex County. Newark Quarry Company. Tenth Census. 26253.

—— Triassic; fine; brown. Newark, Essex County. Newark Quarry Company. Tenth Census. 26254.

—— Triassic; fine; brown. Newark, Essex County. Quarry of Kocher Brothers. Tenth Census. 26255.

—— Triassic; coarse; brown. Orange Mountain, Essex County. Quarry of James Bell & Co. Tenth Census. 26740.

—— Triassic; fine; brown. Avondale, Essex County. Belleville Stone Company. Tenth Census. 26694.

—— Triassic; fine; brown. Pleasant Valley, West Orange, Essex County. F. W. Shrump's quarry. Tenth Census. 26737.

—— Triassic; fine; very light brown. Pleasant Valley, West Orange, Essex County. F. W. Shrump's quarry. Tenth Census, 1880. 26738.

—— Triassic; fine; brown. Paterson, Passaic County. William P. Hartley's quarry. Tenth Census. 26586.

—— Triassic; fine; brown. Little Falls, Passaic County. Quarry of J. C. & R. Stanley. Tenth Census. 26613.

—— Triassic; fine; brown. Little Falls, Passaic County. Quarry of J. C. & R. Stanley. Tenth Census. 26614.

—— Triassic; fine; light brown. Little Falls, Passaic County. Quarry of J. C. & R. Stanley. Tenth Census. 26615.

—— Triassic; fine; gray. Little Falls, Passaic County. Quarry of J. C. & R. Stanley. Tenth Census. 26616.

—— Triassic; fine; French gray. Martinville, Somerset County. Quarry of William E. Bartle & Bro. Tenth Census. 26739.

—— Triassic; fine; dark blue-gray. Milford, Hunterdon County. Smith Clark's quarry. Tenth Census. 26768.

—— Triassic; coarse; light colored. Stockton, Hunterdon County. Peter Best's quarry. Tenth Census. 26769.

Sandstone. Triassic; coarse; light colored. Stockton, Hunterdon County. J. Sillery's quarry. Tenth Census. 26770.

—— Triassic; medium; light brown. Greensburgh, Mercer County. Quarry of L. Clark & Bro. Tenth Census. 26799.

—— Triassic; medium; light brown. Greensburgh, Mercer County. Greensburgh Granite and Freestone Company. Tenth Census. 26800.

—— Triassic; medium; brown. Greensburgh, Mercer County. Quarry of Chas. Keeler & Son. Tenth Census. 26801.

—— Triassic; blue-black; fine and compact. Near Woodsville, Mercer County. Quarry of J. L. Boroughs & Son. Tenth Census. 26823.

—— Triassic; light blue-gray; fine; very compact. Princeton, Mercer County. Thos. Jewell's quarry. Tenth Census. 26842.

—— Lower Silurian; dark blue-gray; very fine and compact. Quarryville, Sussex County. Thos. J. Carr's quarry. Tenth Census. 27071.

—— Lower Silurian; dark blue-gray; fine and compact. Quarryville, Sussex County. Thomas J. Carr's quarry. Tenth Census. 27072.

—— Greenish; coarse; compact. Near Danville, Warren County. E. Bulgin's quarry. Tenth Census, 1880. 26587.

Conglomerate. Dark reddish-brown and white mottled; coarse; very compact and hard. Boonton, Morris County. Tenth Census, 1880. 27052.

—— Coarse; ferruginous. Near May's Landing, Atlantic County. Tenth Census, 1880. 26846.

—— Dark reddish-brown and white mottled; coarse; very compact and hard. Near Morristown, Morris County. Tenth Census, 1880. 26957.

Slate. Black. Princeton, Mercer County. Quarry of S. Margerum. Tenth Census, 1880. 26763.

NEW MEXICO.

Gypsum. White; dark spotted. Bernalillo(?), Bernalillo County. J. S. F. Batchen, 1883. 28586.

Pumice. Coarse; red. Used to some extent for purposes of rough construction. From quarries 3 miles south of Santa Fé, Santa Fé County. Santa Fé quarry. Tenth Census, 1880. 26234.

Rhyolite tuff. Light colored; soft and porous. Santa Fé, Santa Fé County. Tenth Census, 1880. 26233.

Sandstone. Coarse; light colored. Near Santa Fé, Santa Fé County. Santa Fé quarry. Tenth Census, 1880. 26231.

—— Coarse; light reddish-brown. Santa Fé, Santa Fé County. Santa Fé quarry. Tenth Census, 1880. 26232.

—— Fine; reddish brown. Near Las Vegas Hot Springs, San Miguel County. John S. F. Batchen, 1883. 28580.

—— Fine; light red and white striped. Near Las Vegas Hot Springs, San Miguel County. John S. F. Batchen, 1883. 28582.

—— Very light gray; fine and compact. Near Las Vegas Hot Springs, San Miguel County. John S. F. Batchen, 1883. 28583.

—— Fine; light reddish-brown. Near Las Vegas Hot Springs, San Miguel County. John S. F. Batchen, 1883. 28584.

—— Dull red; friable. Near Albuquerque, Valencia County. El Rita quarry. John S. F. Batchen, 1884. 35570.

NEW YORK.

Ophiolite [verdantique marble]. Coarsely granular; green and white speckled; takes a high polish; commercially known as ophite marble. Port Henry, Essex County. Quarries of Burlington Manufacturing Company. Tenth Census, 1880. 26672.

Serpentine [ophiolite. Verdantique marble]. Green and white speckled; coarsely granular. Moriah, Essex County. Centennial, 1876. 17465.

Dolomite [marble]. Archæan; white; coarsely crystalline. Tuckahoe, Westchester County. J. M. Masterton's quarry. Tenth Census, 1880. 26444.

—— Archæan; white; coarsely crystalline. Tuckahoe, Westchester County. J. M. Masterton's quarry. Tenth Census, 1880. 26445.

—— Archæan; white; coarsely crystalline. Tuckahoe, Westchester County. Tuckahoe Marble Company. Tenth Census, 1880. 26414.

—— Archæan; white; coarsely crystalline. Tuckahoe, Westchester County. Tuckahoe Marble Company. Tenth Census, 1880. 26413.

—— Archæan; white; very coarsely crystalline. Pleasantville, Westchester County. Snow Flake Marble Company. Tenth Census, 1880. 26522.

—— Lower Silurian; white; coarsely crystalline. Sing Sing, Westchester County. Colonel Clark, 1880. 25205.

—— Lower Silurian; white; crystalline. Sing Sing, Westchester County. Tenth Census, 1880. 25011.

—— Archæan; pure white; crystalline. South Dover, Dutchess County. E. A. Preston's quarry. Tenth Census, 1880. 26506.

Limestone [marble] Gray, with pink spots; compact; fossiliferous. Used for furniture and interior decorative work. Chazy, Clinton County. Tenth Census, 1880. 26925.

—— Lower Silurian; dark, red spotted; compact; fossiliferous. Used for furniture and interior decorations. Near Plattsburgh, Clinton County. Burlington Manufacturing Company. Tenth Census, 1880. 26671.

—— Upper Silurian; gray, with large fossils. Greensport, Columbia County. F. W. Jones's quarry. Tenth Census, 1880. 26074.

—— "Warwick marble;" red mottled; very coarsely crystalline. 6 by 6 by 1 inch. Orange County. United States General Land Office, 1882. 27258.

Magnesian limestone [marble]. Lower Silurian; nearly black; fossiliferous. Near Saratoga, Saratoga County. Prince Wing's quarry. Tenth Census, 1880. 26089.

—— Lower Silurian; black; very fine and compact. South Glens Falls, Saratoga County. Thomas Reynolds's quarry. Tenth Census, 1880. 26112.

—— Archæan; blue-gray; coarsely crystalline. Near Gouverneur, Saint Lawrence County. Gouverneur Marble Company. Tenth Census, 1880. 26942.

Calcareous dolomite [marble]. Upper Silurian; gray; fossiliferous. Used in the construction of Lenox Library building, New York City. Lockport, Niagara County. R. & J. Carpenter's quarry. Tenth Census, 1880. 26506.

Limestone. Lower Silurian; mottled blue-gray; compact. Sandy Hill, Washington County. Sandy Hill quarry. Tenth Census, 1880. 26828.

—— Lower Silurian; gray; semi-crystalline. Lowville, Lewis County. L. H. Carter's quarry. Tenth Census, 1880. 26980.

—— Devonian; dark gray; fossiliferous. Syracuse, Onondaga County. Centennial. 1876. 17471.

—— Devonian; light drab; fossiliferous. Williamsville, Erie County. J. B. Young's quarry. Tenth Census, 1880. 26622.

Limestone. Devonian; gray; finely fossiliferous; compact. Williamsville, Erie County. W. Foglesanger's quarry. Tenth Census, 1880. 26623.

Magnesian limestone. Lower Silurian; dark blue-gray; fossiliferous. South Glens Falls, Saratoga County. Quarry of Thomas Reynolds & Co. Tenth Census, 1880. 26111.

—— Lower Silurian; dark blue-gray; compact. Near Crown Point, Essex County. Frank Clark's quarry. Tenth Census, 1880. 26123.

—— Lower Silurian; nearly black; compact. Willsborough Point, Essex County. Centennial, 1876. 17519.

—— Lower Silurian; fine; dark gray; nearly black. Willsborough, Essex County. Lake Champlain Quarry Company. Tenth Census, 1880, 26128.

—— Lower Silurian; dark drab; fossiliferous. Three Mile Bay, Jefferson County. O. Fish's quarry. Tenth Census, 1880. 26279.

—— Lower Silurian; gray; finely fossiliferous; compact. Near Prescot, Oneida County. Evan T. Thona's quarry. Tenth Census, 1880. 26329.

—— Lower Silurian; fine; dark gray; nearly black. Amsterdam, Montgomery County. James Griswold's quarry. Tenth Census, 1880. 26238.

—— Lower Silurian; dark gray; fossiliferous. Amsterdam, Montgomery County. D. C. & N. Hewitt's quarry. Tenth Census, 1880. 26239.

—— Lower Silurian; dark gray; fossiliferous. Canajoharie, Montgomery County. Sharper's quarry. Tenth Census, 1880. 26240.

—— Upper Silurian; fine; black; compact. Schoharie, Schoharie County. Z. Brown's quarry. Tenth Census, 1880. 26310.

—— Devonian; fine; dark gray; compact. Cobleskill, Schoharie County. Quarry of Reilly & Scanlan. Tenth Census, 1880. 25909.

—— Upper Silurian; fine; dark gray; nearly black. Howe's Cave, Schoharie County. Howe's Cave Association. Tenth Census, 1880. 26149.

—— Upper Silurian; fine; black. Howe's Cave, Schoharie County. Howe's Cave Association. Tenth Census, 1880. 25841.

—— Upper Silurian; fine; dark gray; nearly black. Howe's Cave, Schoharie County. Howe's Cave Lime and Cement Company. Tenth Census, 1880. 25908.

—— Devonian; dark gray; fine and compact. Springfield Centre, Otsego County. McCabe quarry. Tenth Census, 1880. 25763.

—— Devonian; gray; compact; fossiliferous. Onondaga, Onondaga County. Quarry of Hughes Bros. & Co. Tenth Census, 1880. 26372.

—— Devonian; gray; compact; fossiliferous. Fairmont, Onondaga County. J. Connor's quarry. Tenth Census, 1880. 26354.

—— Devonian; gray; semi-crystalline. Indian Reservation, Onondaga County. Adam Nie's quarry. Tenth Census, 1880. 27069.

—— Devonian; dark gray; fine and compact. Auburn, Cayuga County. Quarry of Goodrich & Son. Tenth Census, 1880. 26389.

—— Devonian; nearly black; fine and compact. Union Springs, Cayuga County. A. B. Miles's quarry. Tenth Census, 1880. 26402.

—— Devonian; nearly black; fine and compact. Waterloo, Seneca County. L. Thomas's quarry. Tenth Census, 1880. 26430.

—— Devonian; nearly black; fine and compact. Waterloo, Seneca County. J. Emmett's quarry. Tenth Census, 1880. 26431.

—— Devonian; dark gray; fine; compact. Le Roy, Genesee County. L. D. Howell's quarry. Tenth Census, 1880. 26511.

—— Devonian; dark mottled; compact. Buffalo, Erie County. J. B. Young quarry. Tenth Census, 1880. Two specimens. 26621.

Magnesian limestone. Blue-gray; fine; compact. Kingston, Ulster County. Quarry of Noon & Madden. Tenth Census, 1880. 26617.

Dolomite. Upper Silurian; dark drab; fine; compact. Rochester, Monroe County. J. B. Pike's quarry. Tenth Census, 1880. 26454.

Calcareous dolomite. Upper Silurian; drab; finely fossiliferous. Lockport, Niagara County. R. & J. Carpenter's quarry. Tenth Census, 1880. 26513.

Biotite granite. Fine; light gray. Garrison, Putnam County. A. C. King's quarry. A. C. King, 1883. 27531.

Hornblende mica granite. Coarse; bright red. Grindstone Island, Jefferson County. R. Forsyth's quarry. Tenth Census, 1880. 27024.

NOTE.—Two large beautiful pillars of this stone are in the senate chamber of the capitol building at Albany, N. Y.

Hornblende gneiss. Medium; dark gray. Glenville, near Tarrytown, Westchester County. Sackett's quarry. Tenth Census, 1880. 26455.

Biotite gneiss. Medium; banded gray and white. Near Hastings, Westchester County. Quarry of Munson & Co. Tenth Census, 1880. 26521.

Gneiss. Coarse; greenish gray. Suffern, Rockland County. Copeland quarry. Tenth Census, 1880. 27050.

Norite. Coarse; dark greenish gray, with blue irridescent spots. Quarries of the Au Sable Granite Company, Keeseville. C. D. Walcott, 1887. 38740.

This stone, which is known commercially as "Au Sable granite," consists essentially of the mineral labradorite and hypersthene. When polished the bluish iridescence from the labradorite is very noticeable. It is a beautiful stone for polished columns and pilasters.

Sandstone. Devonian; brown; very fine and compact. Roxbury, Delaware County. Quarry of Robinson & Soop. Tenth Census, 1880. 25626.

—— Devonian; brown; very fine and compact. Roxbury, Delaware County. B. B. Boughton's quarry. Tenth Census, 1880. 25627.

—— Devonian; gray; fine and compact. Margarettville, Delaware County. Quarry of Grant Bros. Tenth Census, 1880. 25628.

—— Devonian; two specimens; brownish-gray and olive-tinted; fine and compact. Phœnicia, Ulster County. J. L. McGrath's quarry. Tenth Census, 1880. 25638.

—— Devonian; brownish gray; fine and compact. Snider Hollow, Ulster County. Quarry of Jamieson Bros. Tenth Census, 1880. 25639.

—— Devonian; dark blue-gr , fine and compact. Phœnicia, Ulster County. Quarry of Delemater & Bouse. Tenth Census, 1880. 25640.

—— Devonian; dark blue-gray; fine and compact. Phœnicia, Ulster County. J. McGrath's quarry. Tenth Census, 1880. 25641.

—— Devonian; dark blue-gray; fine and compact. Cold Brook Hollow, Ulster County. Quarry of Lane & Co. Tenth Census, 1880. 25670.

—— Devonian; dark blue-gray; fine and compact. Near Boiceville, Ulster County. Quarry of Hewitt Boice. Tenth Census, 1880. 25671.

—— Devonian; dark blue-gray; fine and compact. Broadhead's Bridge, Ulster County. Quarry of Cornish & Rowe. Tenth Census, 1880. 25672.

—— Devonian; dark blue-gray; fine and compact. Broadhead's Bridge, Ulster County. Quarry of W. Davis. Tenth Census, 1880. 25673.

—— Devonian; dark blue-gray; fine and compact. Broadhead's Bridge, Ulster County. Quarry of Hemgerford & Boice. Tenth Census, 1880. 25674.

—— Devonian; dark blue-gray; fine and compact. Stony Hollow, Ulster County. Sweeney's quarry. Tenth Census, 1880. 25704.

Sandstone. Devonian; dark blue-gray; fine and compact. Woodstock, Ulster County. N. Wolven's quarry. Tenth Census, 1880. Two specimens. 25758.

—— Devonian; dark blue-gray; fine and compact. Hallihan's Hill, Ulster County. Quarry of Leahey & Co. Tenth Census, 1880. 25759.

—— Devonian; dark blue-gray; fine and compact. Highwoods Hill, Ulster County. Quarry of Green & Co. Tenth Census, 1880. 25760.

—— Devonian; dark blue-gray; fine and compact. West Hurley, Ulster County. L. Lawson's quarry. Tenth Census, 1880. 25761.

—— Devonian; dark blue-gray; fine and compact. Saw Kill, Ulster County. D. Henderson's quarry. Tenth Census, 1880. 25842.

—— Devonian; very dark bluish-drab; fine and compact. Steeney Kill, Ulster County. R. Dunn's quarry. Tenth Census, 1880. 25843.

—— Devonian; blue-gray; fine and compact. Bristol Hill, Ulster County. T. Grant's quarry. Tenth Census, 1880. 26150.

—— Devonian; dark blue-gray; fine and compact. Morgan Hill, Ulster County. J. Scully's quarry. Tenth Census, 1880. 25844.

—— Devonian; dark blue-gray; fine and compact. Quarryville, Ulster County. Quarry of Mason & Mack. Tenth Census, 1880. 25926.

—— Devonian; dark blue-gray; fine and compact. Quarryville, Ulster County. Quarry of Cunningham Bros. Tenth Census, 1880. 25927.

—— Devonian; blue-gray; fine and compact. Quarryville, Ulster County. Quarry of Peter Daly & Co. Tenth Census, 1880. 25928.

—— Devonian; blue-gray; fine and compact. Near Huntersland, Schoharie County. Middleburgh Bluestone Company. Tenth Census, 1880. 26196.

—— Lower Silurian; compact; reddish. Hammond, Saint Lawrence County. J. Finnegan's quarry. Tenth Census, 1880. 26278.

—— Upper Silurian; fine; light gray. Camden, Oneida County. N. Beebe's quarry. Tenth Census, 1880. 26280.

—— Upper Silurian; fine; light reddish-brown. Albion, Orleans County. G. Brady's quarry. Tenth Census, 1880. 26496.

—— Upper Silurian; fine; light reddish-brown. Albion, Orleans County. Albion and Medina Sandstone Company. Tenth Census, 1880. 26497.

—— Upper Silurian; fine; light reddish-brown. Hulberton, Orleans County. A. J. Squires's quarry. Tenth Census, 1880. 26498.

—— Upper Silurian; fine; very light reddish-brown. Medina, Orleans County. A. J. McCormick's quarry. Tenth Census, 1880. 26514.

—— Fine; very light reddish brown. Hulberton, Orleans County. Quarry of O'Brien & O'Reilly. Tenth Census, 1880. 26515.

—— Upper Silurian; fine; light colored. Medina, Orleans County. Quarry of Kearney, Barrett & Co. Tenth Census, 1880. 26516.

—— Upper Silurian; fine; light colored. Medina, Orleans County. I. Holloway's quarry. Tenth Census, 1880. 26518.

—— Upper Silurian; fine; light reddish-brown. Medina, Orleans County. P. Horan's quarry. Tenth Census, 1880. 26519

—— Upper Silurian; fine; very light gray. Medina, Orleans County. P. Horan's quarry. Tenth Census, 1880. 26520.

—— Upper Silurian. 12-inch cube. Albion, Orleans County. Quarry of G. S. Brady & Co. Gilbert S. Brady, 1884. 35705.

—— Devonian; fine; gray. Corning, Steuben County. L. Field's quarry. Tenth Census, 1880. 26712.

Sandstone. Devonian; fine; blue-gray. Pultney, Steuben County. W. Wagener's quarry. Tenth Census, 1880. 26761.

—— Devonian; fine; blue-gray. Atwater, Cayuga County. J. G. Baeger's quarry. Tenth Census, 1880. 26401.

—— Upper Silurian; reddish brown; medium. Albion, Orleans County. G. Brady's quarry. Tenth Census, 1880. 26494.

—— Upper Silurian; fine; reddish brown. Albion, Orleans County. G. Brady's quarry. Tenth Census, 1880. 26495.

—— Upper Silurian; fine; light gray. 10-inch cube. Lockport, Niagara County. C. Whitmore's quarry. Tenth Census, 1880. 27341.

—— Upper Silurian; fine; light colored. Lockport, Niagara County. C. Whitmore's quarry. Tenth Census, 1880. 26517.

—— Devonian; very dark drab and dark blue-gray; fine and compact. Two specimens. Otsego Lake, Otsego County. J. Wood's quarry. Tenth Census, 1880. 25762.

—— Devonian; fine; blue-gray. Oneonto, Otsego County. L. Orr's quarry. Tenth Census, 1880. 26798.

—— Triassic; medium; reddish brown. Near Nyack, Rockland County. N. Puff's quarry. Tenth Census, 1880. 26590.

—— Devonian; fine; dark blue-gray. Near West Brookville, Sullivan County. West Brockville quarry. Tenth Census, 1880. 26618.

—— Devonian; fine; dark blue-gray. Near West Brookville, Sullivan County. West Brockville quarry. Tenth Census, 1880. 26619.

—— Devonian; fine; gray. Two specimens. Near Liberty, Sullivan County. J. J. Fuller's quarry. Tenth Census, 1880. 26432.

—— Devonian; fine; light gray. Belfast, Allegany County. J. Lang's quarry. Tenth Census, 1880. 26749.

—— Devonian; fine; dark drab. Guilford Centre, Chenango County. L. W. Smith's quarry. Tenth Census, 1880. 26750.

—— Devonian; fine; gray. Guilford, Chenango County. Mrs. W. W. Davis's quarry. Tenth Census, 1880. 26751.

—— Devonian; fine; blue-gray. Trumansburgh, Tompkins County. Quarry of Dumont & Cusic. Tenth Census, 1880. 26760.

—— Devonian; fine; gray. Ithaca, Tompkins County. McClune's quarry. Tenth Census, 1880. 26734.

—— Devonian; fine; light gray. Watkins Glen, Schuyler County. Northern Central Railroad Company. Tenth Census, 1880. 26736.

—— Devonian; blue-gray; fine and compact. Near Reedsville, Albany County. E. Udell's quarry. Tenth Census, 1880. 26151.

—— Lower Silurian; dark blue-gray; fine and compact. Schenectady, Schenectady County. Upper Aqueduct Quarry Company. Tenth Census, 1880. 26075.

—— Fine; blue-gray. Olean, Cattaraugus County. Milo Cook's quarry. Tenth Census, 1880. 26651.

Quartzite. Cambrian; light colored; fine and compact. Fort Ann, Washington County. J. White's quarry. Tenth Census, 1880. 25946.

—— Potsdam; compact; light red. Near Potsdam, Saint Lawrence County. Potsdam quarry. Tenth Census, 1880. 26268.

Argillaceous sandstone. Devonian; fine; blue-gray. Warsaw, Wyoming County. Quarry of Morris & Son. Tenth Census, 1880. 26650.

Slate. Purple. Middle Granville, Washington County. Albany Slate Company. Tenth Census, 1880. 25945.

Slate. Green. 4 by 4 by 3 inches. Hampton, Washington County. Quarry of D. Williams & Brothers. Tenth Census, 1880. 25973.

—— Red. 4 by 4 by 1½ inches. Hampton, Washington County. Quarry of L. J. Warren. Tenth Census, 1880. 25974.

—— Green. 4 by 4 by 2½ inches. Hampton, Washington County. New England Quarry Company. Tenth Census, 1880. 25976.

—— Purple. 4 by 4 by 1½ inches. Hampton, Washington County. New England Quarry Company. Tenth Census, 1880. 25977.

—— Dull red. 4 by 4 by 1½ inches. Middle Granville, Washington County. Middle Granville Quarry. Tenth Census, 1880. 25978.

—— Bright red. 4 by 4 by 1 inch. Granville, Washington County. Tenth Census. 25979.

—— Bright red. 4 by 4 by 1 inch., Granville, Washington County. North Bend Quarry Company. Tenth Census, 1880. 25980.

—— Dull, reddish brown. 4 by 4 by 1½ inches. Middle Granville, Washington County. Penrhyn Slate Company. Tenth Census, 1880. 25981.

—— Dull, reddish brown. 4 by 4 by 1½ inches. Middle Granville, Washington County. Penrhyn Slate Company. Tenth Census, 1880. 25982.

—— Greenish. 4 by 4 by 1 inch. Middle Granville, Washington County. Penrhyn Slate Company. Tenth Census, 1880. 25983.

—— Greenish, purple and blue-black. Six specimens. Slabs 8 inches square. Centennial, 1876. 26032.

—— Grayish brown. 4 by 3 by 2 inches. Salem, Washington County. Salem Slate Company. Tenth Census, 1880. 26052.

—— Greenish. Slab 8 inches square, and 4 by 4 by 1 inch. Two specimens. Granville, Washington County. Warren Slate Company. Centennial, 1876. 27001.

Calcareous sandstone. Devonian; fine; very light gray. Two specimens. Cannisteo, Steuben County. J. Mullen's quarry. Tenth Census, 1880. 26706.

—— Devonian; fine; blue-gray. Covert, Seneca County. C. O. Ogden's quarry. Tenth Census, 1880. 26735.

NORTH CAROLINA.

Steatite. Fine; compact; light greenish gray. Used for "white earth" and French chalk. Nantahalah, Swain County. Tenth Census, 1880. 26137.

—— Fine compact; light greenish gray. Used as above. Seven miles northeast of Murphy, Cherokee County. W. C. Kerr, 1883. 27654.

Steatite [soapstone]. Coarse; compact; dark gray. Near Greensborough, Guilford County. W. C. Kerr, 1883. 27662.

—— Coarse; compact; blue-gray. Ball Mountain, Ashe County. J. Hardin's quarry. J. B. Colvan, 1883. 28168.

—— Fine; light blue-gray; schistose. Myatt's Mill, Wake County. (Through W. S. Yates.) 1884. 36853.

—— Coarse; porous; blue-gray. Alamance County. W. C. Kerr, 1887. 27664.

Limestone [marble]. Dark blue-gray; crystalline. Cherokee County. 36142.

—— Archæan; light pink; greenish spots; crystalline. 7½ by 6 by 2 inches. Cherokee County. 27822.

—— Archæan; blue-gray; crystalline. Near Murphy, Cherokee County. Valley River Mining Company. W. H. Kerr, 1883. 27655.

Limestone [marble]. Archæan; blue-gray; crystalline. Valley Town, Cherokee County. S. Whittaker's quarry. W. H. Kerr, 1883. 27656.

—— Archæan; light blue-gray; finely crystalline. Nottla, Cherokee County. Centennial, 1876. 17512.

—— Archæan; dark gray; crystalline. Near Valley Town, Cherokee County. T. Young's quarry. Tenth Census, 1880. 27658.

—— Archæan; light pink; finely crystalline. Two specimens. Red Marble Gap, Macon County. W. H. Kerr, 1883. 27659.

—— Archæan; light pink, with greenish mottling; crystalline. Nantahalah, Swain County. Centennial, 1876. 17513.

Siliceous dolomite. Archæan; red; compact. Warm Springs, Madison County. W. C. Kerr, 1883. 27605.

Magnesian limestone. Archæan; dark mottled; fine; compact. Warm Springs, Madison County. Tenth Census, 1880. 27604.

Shell limestone. Eocene; coarse; cellular. 12-inch cube. New Berne, Craven County. Centennial, 1876. 25345.

—— Eocene; coarse; cellular. New Berne, Craven County. Tenth Census, 1880. 27624.

—— Eocene; light colored; cellular. Rocky Point, Pender County. Quarry of French Brothers. Tenth Census, 1880. 27625.

Limestone. Archæan; blue-gray; crystalline. Near Murphy, Cherokee County. Valley River Mining Company. W. H. Kerr, 1883. 27655.

Biotite granite. Medium; pink. Louisburgh, Franklin County. Colonel Ruffin's quarry. W. C. Kerr, 1883. 27633.

—— Fine; pinkish gray. Louisburgh, Franklin County. W. C. Kerr, 1883. 27600.

—— Medium; pink. Cedar Rock, Franklin County. W. T. King's quarry. W. H. Kerr, 1883. 27636.

—— Coarse; porphyritic; pink and yellowish spotted. Contentnea Creek, Wilson County. W. H. Kerr, 1883. 27626.

—— Fine; light gray. Nine miles south of Warrenton, Warren County. J. S. Smith's quarry. W. H. Kerr, 1883. 27649.

—— Medium; gray. Lexington, Davidson County. C. H. Scott, 1883. 27594.

—— Medium; gray. Lexington, Davidson County. C. H. Scott, 1883. 27596.

—— Fine; gray. Alamance County. C. H. Scott, 1883. 27597.

—— Fine; gray. Alamance County. C. H. Scott, 1883. 27599.

—— Fine; light gray. Seven miles below Asheville, Buncombe County. W. C. Kerr, 1883. 27606.

—— Medium; gray. Oxford, Granville County. J. H. Horner's quarry. W. C. Kerr, 1883. 27632.

—— Coarse; light gray. Mount Airy, Surry County. R. S. Gilmer's quarry. W. H. Kerr, 1883. 27613.

—— Coarse; gray. Near Charlotte, Mecklenburgh County. W. Phifer's quarry. W. C. Kerr, 1883. 27589.

—— Medium; gray. Near Charlotte, Mecklenburgh County. W. C. Kerr, 1883. 27590.

—— Medium; gray. Charlotte, Mecklenburgh County. W. C. Kerr, 1883. 27591.

—— Coarse; gray. Davidson College, Mecklenburgh County. L. Pott's quarry. W. H. Kerr, 1883. 27644.

—— Fine; gray. Near Gastonia, Gaston County. Quarry of Holland & Paysour. W. H. Kerr, 1880. 27622.

Biotite granite. Fine; light gray. Near Gastonia, Gaston County. J. Hawkin's quarry. W. H. Kerr, 1880. 27621.

—— Coarse; gray. Three miles north of Garibaldi, Gaston County. C. L. Hope's quarry. W. H. Kerr, 1880. 27620.

—— Medium; light gray. Near Winston, Forsyth County. Mrs. Charles's quarry. W. H. Kerr, 1883. 27614.

—— Medium; greenish gray. Buck Horn Falls, Harnett County. Quarry of Hick & Lobdell. W. H. Kerr, 1883. 27653.

—— Fine; gray. Mooresville, Iredell County. J. C. Hargrave's quarry. W. H. Kerr, 1883. 27646.

—— Coarse; indistinctly porphyritic; gray. Mount Mourne, Iredell County. J. H. Reid's quarry. W. H. Kerr, 1883. 27645.

—— Medium; gray. Greensborough, Guilford County. C. H. Scott, 1883. 27629.

—— Medium; gray. Greensborough, Guilford County. C. H. Scott, 1883. 27630.

—— Coarse; greenish with large porphyritic crystals of pinkish feldspar. Rockingham, Richmond County. W. C. Kerr, 1883. 27610.

—— Coarsely porphyritic; pinkish and olive-green. Two and a half miles west of Rockingham, Richmond County. Cheraw and Chester Railroad. W. C. Kerr, 1883. 27640.

—— Gray; coarsely porphyritic, with light pink feldspars. Foot cube. Anson County. Centennial, 1876. 25509.

Muscovite granite. Fine; light gray. Warrenton, Warren County. N. M. Norwood's quarry. W. H. Kerr, 1883. 27648.

Granite. Medium; very light pink. Near Salisbury, Rowan County. W. C. Kerr, 1883. 27601.

—— Medium; very light gray. Salisbury, Rowan County. J. J. Bassingo's quarry. W. H. Kerr, 1883. 27615.

—— Medium; very light pinkish gray. Ten miles south of Salisbury, Rowan County. J. J. Bassingo's quarry. W. H. Kerr, 1880. 27617.

—— Fine; pink. Hillsborough, Orange County. A. W. Graham's quarry. W. C. Kerr, 1883. 27631.

Biotite muscovite granite. Medium; light pinkish gray. Nineteen miles south of Salisbury, Rowan County. J. J. Bassingo's quarry. W. H. Kerr, 1883. 27616.

Hornblende biotite granite. Coarse; gray with light green spots. Near Charlotte, Mecklenburgh County. T. Graham's quarry. W. C. Kerr, 1883. 27588.

Biotite gneiss. Medium; gray. Near Shelby, Cleveland County. C. Hendrick's quarry. W. H. Kerr, 1880. 27623.

—— Gray; porphyritic. Henry's Station, McDowell County. Western North Carolina Railroad. W. H. Kerr, 1883. 27637.

—— Coarse; gray. Hickory, Caldwell County. G. W. Harper's quarry. W. H. Kerr, 1883. 27641.

—— Coarse; pinkish gray. Three and a half miles north of Toisnot, Wilson County. P. Linehan's quarry. W. H. Kerr, 1883. 27627.

—— Medium; dark gray. Henderson, Vance County. W. C. Kerr, 1883. 27603.

—— Very coarse; light greenish gray. Near Danbury, Stokes County. W. H. Kerr, 1883. 27612.

—— Medium; dark gray. Poison Springs, Iredell County. J. Linster's quarry. W. H. Kerr, 1883. 27642.

—— Fine; light gray. Raleigh, Wake County. State quarries. W. C. Kerr, 1883. 27660.

Biotite gneiss. Fine; light gray. Near Raleigh, Wake County. W. C. Kerr, 1883. 29639.

—— Coarse; light gray; indistinctly porphyritic. Ten miles north of Greensborough, Guilford County. C. H. Scott, 1883. 27593.

—— Medium; light gray. Jamestown, Guilford County. C. H. Scott, 1883. 27611.

Gneiss. Fine; pink. Concord, Cabarrus County. W. H. Kerr, 1880. 27619.

Hornblende biotite gneiss. Medium; dark gray. Near Alexander, Buncombe County. W. C. Kerr, 1883. 27607.

—— Medium; dark gray. Davidson College, Mecklenburgh County. D. Sloan's quarry. W. H. Kerr, 1883. 27643.

Gneiss. Fine; red and light mottled. Mooresville, Iredell County. Quarry of McNeilly & McPherson. W. H. Kerr, 1883. 27647.

Hornblende gneiss. Fine; light greenish gray. Morganton Depot, Burke County. Avery's quarry. W. H. Kerr, 1883. 27639.

Quartz porphyry [leopardite]. White; black spotted; 4 by 4 by 1½ inches. Near Charlotte, Mecklenburgh County. W. J. Yates quarry. Tenth Census, 1880. 25840.

—— Nearly white with dark spots. Charlotte, Mecklenburgh County. Centennial 1876. 10770.

These porphyries take the popular name "leopardite" from their spotted appearance. In some cases the coloring material instead of being arranged in oval spots takes most delicate dendritic or fern-like forms. They are very hard and consequently used only for purposes of rough construction.

Sandstone. Triassic; fine; reddish brown. Wadesborough, Anson County. W. C. Kerr, 1883. 27608.

—— Triassic; fine; light brown. Sanford, Moore County. J. W. Scott's quarry. W. H. Kerr, 1883. 27634.

—— Triassic; fine; light brown. Egypt, Chatham County. J. Legroves's quarry. W. H. Kerr, 1883. 27635.

—— Triassic; light colored; medium. Durham, Durham County. Trap quarry W. C. Kerr, 1883. 27651.

—— Triassic; fine; reddish brown. Near Durham, Durham County. Quarry of Needham & McPherson. W. C. Kerr, 1883. 27652.

—— Triassic; fine; very light brown. Near Morrisville, Wake County. Gift of the county through W. S. Yeates, 1884. 36852.

—— Fine; gray; 10-inch cube. Raleigh, Wake County. Centennial 1876. 17475.

OHIO.

Limestone. Lower Silurian; dark gray. 12 by 13 by 7 inches. Centennial, 1876. 25198.

—— Lower Silurian; dark gray. 14 by 14 by 8 inches. Centennial, 1876. 25199.

—— Devonian; drab; fine; compact. Kelley's Island, Erie County. Quarry of Kelley & Co. Tenth Census, 1880. 26284.

—— Devonian. Bellefountaine, Logan County. Quarry of Angel, Miller & Co. Tenth Census, 1880. 27162.

—— Carboniferous; drab; fine; compact. Two specimens. Bellaire, Belmont County. Samuel Rowe's quarry. Tenth Census, 1880. 25613.

—— Upper Silurian; light colored. 12-inch cube. Covington, Miami County. T. W. Butt's quarry. Tenth Census, 1880. 27200.

—— Upper Silurian; dark mottled; fine-grained. Two specimens. Piqua, Miami County. Quarry of H. Clark & Son. Tenth Census, 1880. 25317.

Limestone. Carboniferous; dark; compact; fossiliferous. Zanesville, Muskingum County. Philip Moran's quarry. Tenth Census, 1880. 25535.

—— Sub-Carboniferous; light colored; fine; compact. Two specimens. Newtonville, Muskingum County. T. B. Townsend's quarry. Tenth Census, 1880. 25536.

—— Upper Silurian; drab; fine and compact; pyritiferous. Two specimens. Near Xenia, Greene County. W. McDonald's quarry. Tenth Census, 1880. 25357.

—— Upper Silurian; light colored; fine and compact. Two specimens. Near Dayton, Montgomery County. Huffman Stone Company. Tenth Census, 1880. 27163.

—— Lower Silurian; dark mottled; fossiliferous. Two specimens. Hamilton, Butler County. Quarry of Kilfoyle & Joyce. Tenth Census, 1880. 25274.

—— Upper Silurian; fine-grained; yellow spotted. Near Lumberton, Clinton County. W. F. Oglesbee's quarry. Tenth Census, 1880. 25382.

Bituminous dolomite. Devonian; light colored; fossiliferous. Two specimens. Point Marblehead, Ottawa County. Quarry of Clemons & Sons. Tenth Census, 1880. 26087.

—— Upper Silurian; light colored; fine-grained and cellular. Two specimens. Near Fremont, Sandusky County. Quarry of Quilter Brothers. Tenth Census, 1880. 25283.

—— Devonian; drab; fine and compact. Sandusky, Erie County. Quarry of I. T. Davis. Tenth Census, 1880. 26084.

—— Devonian; drab; fine and compact. Sandusky, Erie County. W. Hubbard's quarry. Tenth Census, 1880. 26085.

—— Devonian; drab; fine and compact. Two specimens. Sandusky, Erie County. C. Schoepfle's quarry. Tenth Census, 1880. 26086.

—— Devonian; light colored; fine; compact. Sandusky, Erie County. Ambrose Lieb's quarry. Tenth Census, 1880. 26106.

—— Upper Silurian; light colored; fine-grained; cellular. Two specimens. Tiffin, Seneca County. J. L. King's quarry. Tenth Census, 1880. 25527.

—— Upper Silurian; drab; fine; compact. Findlay, Hancock County. Quarry of Altman & Pressnell Company. Tenth Census, 1880. 25294.

—— Upper Silurian; dark mottled; vesicular; semi-crystalline. Two specimens. Near Ottawa, Putnam County. J. Hager's quarry. Tenth Census, 1880. 25315.

—— Upper Silurian; gray; laminated. Near Columbus Grove, Putnam County. J. Postlewait's quarry. Tenth Census, 1880. 25333.

—— Upper Silurian; brown mottled; fine-grained; compact. Two specimens. Bluffton, Allen County. Quarry of Ritzler & Greenwald. Tenth Census, 1880. 25312.

—— Upper Silurian; brown; fine-grained; compact. Two specimens. Near Lima, Allen County. J. Custer's quarry. Tenth Census, 1880. 25313.

—— Upper Silurian; dark drab; fine-grained; compact. Near Lima, Allen County. B. A. Armentrout's quarry. Tenth Census, 1880. 25337.

—— Upper Silurian; dark mottled; fine-grained. Two specimens. Lima, Allen County. William Pugh's quarry. Tenth Census, 1880. 25320.

—— Upper Silurian; light colored; fine and compact. Two specimens. Near Urbana, Champaign County. D. W. Happersett's quarry. Tenth Census, 1880. 25296.

—— Upper Silurian; very light brown; fine and compact. Two specimens. Greenfield, Highland County. Quarry of G. I. Rucker & Son. Tenth Census, 1880. 25381.

Bituminous dolomite. Upper Silurian; brown; fine-grained; compact. Two specimens. Lexington, Highland County. Mrs. L. Dunn's quarry. Tenth Census, 1880. 25427.

Dolomite. Devonian. Light colored; fine-grained; compact. Two specimens. White House, Lucas County. Quarry of Pray & Hall. Tenth Census, 1880. 25282.

—— Devonian; drab; fine; compact. Two specimens. Near Weston, Wood County. L. S. Pugh's quarry. Tenth Census, 1880. 25324.

—— Upper Silurian; drab mottled; coarsely vesicular. Near Van Wert, Van Wert County. Palmer's quarry. Tenth Census, 1880. 26510.

—— Devonian; dark gray; fine-grained; compact. Two specimens. Marion, Marion County. Quarry of Peters & Lawrence. Tenth Census, 1880. 25322.

—— Devonian; dark; fine-grained compact. Two specimens. Marion, Marion County. Quarry of Haberman & Riley. Tenth Census, 1880. 25323.

—— Devonian; light colored; fine-grained; compact. Two specimens. Near Bellefontaine, Logan County. Quarry of Angel, Miller & Co. Tenth Census, 1880. 25290.

—— Upper Silurian; light colored; cellular. Two specimens, Near Springfield, Clarke County. Quarry of Moores & Co. Tenth Census, 1880. 27164.

—— Upper Silurian; light drab; fine and compact. Springfield, Clarke County. J. Mowatt's quarry. Tenth Census, 1880. 25293.

—— Upper Silurian; drab; cellular. Springfield Clarke County. W. S. Thompson's quarry. Tenth Census, 1880. 25291.

—— Upper Silurian; light drab and blue-gray. Two specimens. Yellow Springs, Greene County. W. Sroufe's quarry. Tenth Census, 1880. 25292.

—— Upper Silurian; drab mottled; fine; compact. Eaton, Preble County. Quarry of Young & Christman. Tenth Census, 1880. 25268.

Magnesian limestone. Devonian; drab; fine-grained; fossiliferous. Bloomville, Seneca County. A. Reichert's quarry. Tenth Census, 1880. 25660.

—— Upper Silurian; very light drab. Piqua River, Miami County. H. G. Deweese's quarry. H. G. Deweese, 1883. 27514.

—— Upper Silurian; bluish drab; fine and compact. Two specimens. Covington, Miami County. Quarry of Butt & Battorf. Tenth Census, 1880. 27173.

—— Devonian; drab; fine-grained; compact. Near Columbus, Franklin County. Quarry of Lilley & Poston. Tenth Census, 1880. 25376.

—— Upper Silurian; bluish drab; fine and compact. Near Dayton, Montgomery County. Huffman Stone Company. Tenth Census, 1880. 27175.

—— Upper Silurian; bluish drab; fine and compact. 12-inch cube. Near Dayton, Montgomery County. Huffman Stone Company. Tenth Census, 1880. 27175.

—— Upper Silurian; light drab; fine and compact. Two specimens. Near Dayton, Montgomery County. W. H. Huston's quarry. Tenth Census, 1880. 27192.

—— Upper Silurian; drab; fine and compact. Two specimens. Near Dayton, Montgomery County. Huffman Stone Company. Tenth Census, 1880. 25297.

Siliceous dolomite. Upper Silurian; light and drab; fine-grained. Two specimens. Covington, Miami County. Quarry of N. W. Furnas. Tenth Census, 1880. 25319.

—— Devonian; dark; fine-grained; compact. Two specimens. Near Marion, Marion County. F. Hinamon's quarry. Tenth Census, 1880. 25321.

—— Upper Silurian; light drab; finely cellular. Two specimens. Springfield, Clarke County. George H. Frey's quarry. Tenth Census, 1880. 25295.

Siliceous dolomite. Upper Silurian; drab; fine-grained. New Paris, Preble County. T. J. Smith's quarry. Tenth Census, 1880. 25264.

—— Upper Silurian; drab; fine-grained; compact. Two specimens. Euphemia, Preble County. I. J. Weaver's quarry. Tenth Census, 1880. 25267.

Ferruginous limestone. Carboniferous; dark; fine and compact. Two specimens. Near Millersburgh, Holmes County. A. Geib's quarry. Tenth Census, 1880. 25449.

Sandstone. Devonian; fine; gray. Monclova, Lucas County. S. Wagner's quarry. Tenth Census, 1880. 25281.

—— Circular slab, 3 feet 2 inches in diameter and 3¼ inches thick. Amherst, Lorain County. Centennial, 1876. 25194.

—— Broken column, 12 inches at base by 20 inches high. Amherst. Centennial, 1876. 25193.

—— Carved post, about 14 inches at base by 26 inches high. Amherst. Centennial, 1876. 18931.

—— Sub-Carboniferous; fine; light gray. Amherst, Lorain County. Amherst Stone Company. Tenth Census, 1880. 25472.

—— Sub-Carboniferous; fine; light gray. Amherst, Lorain County. Quarry of Worthington & Sons. Tenth Census, 1880. 25706.

—— Sub-Carboniferous; fine; light brown. Foot cube. Amherst, Lorain County. Centennial, 1876. 26034.

—— Sub-Carboniferous; light brown; medium. Amherst, Lorain County. Ohio Building Stone Company. J. S. F. Batchen, 1883. 27357.

—— Sub-Carboniferous; fine; light gray. Amherst, Lorain County. Colonel Clark, 1881. 25023.

—— Sub-Carboniferous; fine; light gray. Amherst, Lorain County. Quarry of Haldeman & Son. Tenth Census, 1880. 25384.

—— Sub-Carboniferous; fine; light gray and very light brown; two specimens. Amherst, Lorain County. J. Nicholl's quarry. Tenth Census, 1880. 25385.

—— Sub-Carboniferous; very light buff; medium. Amherst, Lorain County. Quarry of Wilson & Hughes. Tenth Census, 1880. 25421.

—— Sub-Carboniferous; fine; light gray and buff. Two specimens. Elyria, Lorain County. Quarry of Mussey & Co. Tenth Census, 1880. 25383.

—— Sub-Carboniferous; gray and very light brown. Two specimens. Near Elyria, Lorain County. J. Eschtruth's quarry. Tenth Census, 1880. 25386.

—— Sub-Carboniferous; Elyria, Lorain County. J. Weller's quarry. Tenth Census, 1880. 25389.

—— Sub-Carboniferous; fine; light colored, Brownhelm, Lorain County. Quarry of Worthington & Son. Tenth Census, 1880. 25707.

—— Sub-Carboniferous; medium; light buff. Ridgeville, Lorain County. H. L. Beebe's quarry. Tenth Census, 1880. 25471.

—— Sub-Carboniferous; coarse; light colored. Independence, Cuyahoga County. J. R. Hurst's quarry. Tenth Census, 1880. 25473.

—— Sub-Carboniferous; coarse; light colored. Bedford, Cuyahoga County. Bedford Stone Company. Tenth Census, 1880. 25458.

—— Sub-Carboniferous; fine; light colored. Brooklyn, Cuyahoga County. J. Hoehn's quarry. Tenth Census, 1880. 25459.

—— Sub-Carboniferous; medium; light colored. Independence, Cuyahoga County. Quarry of Wilson & Hughes. Tenth Census, 1880. 25456.

—— Sub-Carboniferous; fine; light blue-gray. Newburgh, Cuyahoga County. Quarry of W. H. Caine. Tenth Census, 1880. 25457.

Sandstone. Sub-Carboniferous; light colored; medium. Two specimens. Newburgh, Cuyahoga County. Quary of Edwards Brothers. Tenth Census, 1880. 25433.

—— Sub-Carboniferous; light colored; medium. East Cleveland, Cuyahoga County. W. A. Neff's Quarry. Tenth Census, 1880. 25423.

—— Sub-Carboniferous; light colored; medium. Two specimens. East Cleveland. Cuyahoga County. C. E. Reader's quarry. Tenth Census, 1880. 25434.

—— Sub-Carboniferous; light colored; medium. East Cleveland, Cuyahoga County. J. Haycox's quarry. Tenth Census, 1880. 25435.

—— Sub-Carboniferous; fine; light gray. Slab, 4 by 8 feet. Euclid, Cuyahoga County. Forest City Stone Company. Centennial, 1876. 25195.

—— Sub-Carboniferous; fine; blue-gray. Euclid, Cuyahoga County. J. Wagner's quarry. Tenth Census, 1880. 25388.

—— Sub-Carboniferous; fine; light blue-gray. Euclid, Cuyahoga County. Forest City Stone Company. Tenth Census, 1880. 25430.

—— Sub-Carboniferous; fine; light blue-gray. Euclid, Cuyahoga County. Quarry of McFarland Brothers. Tenth Census, 1880. 25431.

—— Sub-Carboniferous; fine; very light gray. Euclid, Cuyahoga County Quarry of Maxwell & Malone. Tenth Census, 1880. 25432.

—— Sub-Carboniferous; fine; very light gray. Berea, Cuyahoga County. Colonel Clark, 1881. 25018.

—— Sub-Carboniferous; fine; light gray. Three specimens. Berea, Cuyahoga County. McDermott and Berea Stone Company. Tenth Census, 1880. 25387.

—— Sub-Carboniferous; light colored; medium. Three miles east of Berea, in Middleburg Township, Cuyahoga County. B. Rafferty's quarry. Tenth Census, 1880. 25390.

—— Sub-Carboniferous; fine; light gray. Foot cube. Berea, Cuyahoga County. Centennial, 1876. 26035.

—— Sub-Carboniferous; fine; very light gray. Windsor, Ashtabula County. R. T. Stewart's quarry. Tenth Census, 1880. 25391.

—— Sub-Carboniferous; fine; light gray and very light brown. Two specimens. Near Norwalk, Huron County. C. Grannell's quarry. Tenth Census, 1880. 25285.

—— Sub-Carboniferous; fine; gray. Near Norwalk, Huron County. William Perrin's quarry. Tenth Census, 1880. 25284.

—— Sub-Carboniferous; fine; light gray. Greenfield, Huron County. G. Graham's quarry. Tenth Census, 1880. 25522.

—— Carboniferous; coarse; buff. Twinsburgh, Summit County. G. Parmelee's quarry. Tenth Census, 1880. 25422.

—— Sub-Carboniferous; medium; light colored. Two specimens. Peninsula, Summit County. F. Schumacher's quarry. Tenth Census, 1880. 25494.

—— Carboniferous; light yellow; medium. Akron, Summit County. J. Hugill's quarry. Tenth Census, 1880. 25495.

—— Sub-Carboniferous; fine; very light blue-gray. North Hampton, Summit County. Quarry of Hovey & Brown. Tenth Census, 1880. 25496.

—— Carboniferous; light colored; medium. Windham, Portage County. Quarry of Case & King. Tenth Census, 1880. 25392.

—— Sub-Carboniferous; fine; dark gray. Two specimens. Near Warren, Trumbull County. Austin Flagstone Company. Tenth Census, 1880. 26509.

—— Sub-Carboniferous; fine; light gray. Leesville, Crawford County. Leesville Stone Company. Tenth Census, 1880. 25534.

Sandstone. Sub-Carboniferous; light and dark brown. Two specimens. Bellville, Richland County. D. W. Zent's quarry. Tenth Census, 1880. 25380.

—— Sub-Carboniferous; fine; very light gray. Plymouth, Richland County. William J. Bevier's quarry. Tenth Census, 1880. 25526.

—— Sub-Carboniferous; coarse; red and pink. Two specimens. Mansfield, Richland County. Quarry of C. Voetsch. Tenth Census, 1880. 25518.

—— Sub-Carboniferous; medium; yellow. Mansfield, Richmond County. T. Cline's quarry. Tenth Census, 1880. 25519.

—— Sub-Carboniferous; coarse; light colored. Weller, Richland County. S. Shively's quarry. Tenth Census, 1880. 25520.

—— Sub-Carboniferous; fine; very light drab. Plymouth, Richland County. S. W. Tuttle's quarry. Tenth Census, 1880. 25521.

—— Carboniferous; medium; yellowish. Warwick, Wayne County. Walnut Grove Stone Company. Tenth Census, 1880. 25497.

—— Sub-Carboniferous; fine; very light colored. Wooster, Wayne County. Quarry of Coe Brothers. Tenth Census, 1880. 25517.

—— Carboniferous; light colored; medium. Near Massillon, Stark County. Quarry of Warthorst & Co. Tenth Census, 1880. 25468.

—— Carboniferous; light pink; medium. Near Massillon, Stark County. Quarry of Warthorst & Co. Tenth Census, 1880. 25468.

—— Carboniferous; coarse; light colored. Near New Lisbon, Columbiana County. J. H. O'Mara's quarry. Tenth Census, 1880. 25876.

—— Carboniferous; light colored; medium. Near Youngstown, Mahoning County. T. Connell's quarry. Tenth Census, 1880. 25877.

—— Carboniferous; fine; gray. Youngstown, Mahoning County. J. Holden's quarry. Tenth Census, 1880. 25878.

—— Sub-Carboniferous; fine; very light gray. North Bloomfield, Morrow County. J. Flower's quarry. Tenth Census, 1880. 25552.

—— Sub-Carboniferous; fine; very light gray. Iberia, Morrow County. Quarry of Crane Brothers. Tenth Census, 1880. 25553.

—— Sub-Carboniferous; fine; light colored. Two specimens. Mount Gilead, Morrow County. B. S. Russell's quarry. Tenth Census, 1880. 25406.

—— Sub-Carboniferous; fine; light colored. Near Iberia, Morrow County. J. J. McClarren's quarry. Tenth Census, 1880. 25875.

—— Sub-Carboniferous; coarse; dark yellow. Ten miles east of Mount Vernon, Howard Station, Knox County. I. Crichfield's quarry. Tenth Census, 1880. 25416.

—— Carboniferous; fine; light colored. Foot cube. Berlin, Holmes County. Centennial, 1876. 17472.

—— Carboniferous; medium; light colored. Near Millersburgh, Holmes County. W. H. Ling's quarry. Tenth Census, 1880. 25450.

—— Carboniferous; fine; light gray. Near Millersburgh, Holmes County. W. Cary's quarry. Tenth Census, 1880. 25615.

—— Carboniferous; light colored; medium. Near New Philadelphia, Tuscarawas County. Quarry of A. Mathias. Tenth Census, 1880. 25515.

—— Carboniferous; light colored. Near canal, Dover, Tuscarawas County. Tuscarawas Valley Coal and Iron Company. Tenth Census, 1880. 25516.

—— Carboniferous; coarse; light colored. Near Carrollton, Carroll County. N. M. Smith's quarry. Tenth Census, 1880. 25493.

—— Sub-Carboniferous; fine; light blue-gray and light brown. Two specimens. Near Sunbury, Delaware County. H. Fleckner's quarry. Tenth Census, 1880. 25378.

Sandstone. Sub-Carboniferous; fine; very light gray. Near Sunbury, Delaware County. C. B. Gaylord's quarry. Tenth Census, 1880. 25379.

—— Sub-Carboniferous; medium; light pinkish. Near Newark, Licking County. C. Daugherty's quarry. Tenth Census, 1880. 25316.

—— Sub-Carboniferous; coarse; buff. Near Newark, Licking County. C. Daugherty's quarry. Tenth Census, 1880. 25318.

—— Sub-Carboniferous; coarse; light colored. Near Newark, Licking County. O. Z. Hillery's quarry. Tenth Census, 1880. 25336.

—— Sub-Carboniferous; fine; very light gray; olive-tinted. Newark, Licking County. J. Coyle's quarry. Tenth Census, 1880. 25373.

—— Sub-Carboniferous; fine; light blue-gray. Near Newark, Licking County. J. Coyle's quarry. Tenth Census, 1880. 25311.

—— Carboniferous; medium; light colored and red. Two specimens. Coshocton, Coshocton County. M. Cheney's quarry. Tenth Census, 1880. 25524.

—— Carboniferous; medium; very light colored. Near Coshocton, Coshocton County. M. Cheney's quarry. Tenth Census, 1880. 25525.

—— Carboniferous; light colored; medium. Steubenville, Jefferson County. Quarry of Archer and Boals. Tenth Census, 1880. 25642.

—— Carboniferous; light colored; medium. Steubenville, Jefferson County. Quarry of Archer & Boals. Tenth Census, 1880. 25643.

—— Carboniferous; light colored; medium. Steubenville, Jefferson County. Quarry of Floto & Bros. Tenth Census, 1880. 25644.

—— Carboniferous; coarse; light colored. Zanesville, Muskingum County. T. B. Townsend's quarry. Tenth Census, 1880. 25537.

—— Carboniferous; fine; gray and light brown. Two specimens. Cumberland, Guernsey, and Noble Counties. T. B. Townsend's quarry. Tenth Census, 1880. 25568.

— — Carboniferous; coarse; light colored. Cambridge, Guernsey County. S. Barr's quarry. Tenth Census, 1880. 25574.

—— Carboniferous; light colored; medium. Lewis's Mills, Belmont County. J. Hutchinson's quarry. Tenth Census, 1880. 25588.

—— Carboniferous; fine; gray; olive-tinted. Bellaire, Belmont County. W. J. McClain's quarry. Tenth Census, 1880. 25612.

—— Carboniferous; coarse; light colored. Near Bellaire, Belmont County. J. R. Robinson's quarry. Tenth Census, 1880. 25614.

—— Sub-Carboniferous; coarse; buff and yellow. Two specimens. Lancaster, Fairfield County. C. Bowmaster's quarry. Tenth Census, 1880. 25326.

—— Sub-Carboniferous; coarse; light colored. Lancaster, Fairfield County. C. Bowmaster's quarry. Tenth Census, 1880. 25332.

—— Sub-Carboniferous; coarse; light colored. Lancaster, Fairfield County. Quarry of Sharp & Crook. Tenth Census, 1880. 25335.

—— Sub-Carboniferous; fine; gray. Lithopolis, Fairfield County. Lithopolis quarry. Tenth Census, 1880. 25325.

—— Sub-Carboniferous; coarse; yellow. Near Lancaster, Fairfield County. Quarry of Sharp & Crook. Tenth Census, 1880. 25314.

—— Sub-Carboniferous; fine; light blue-gray. Near Columbus, Franklin County. William A. Forrester's quarry. Tenth Census, 1880. 25377.

—— Sub-Carboniferous; coarse; buff. Logan, Hocking County. Quarry of Weitzell Bros. Tenth Census, 1880. 25334.

—— Carboniferous; fine; gray; olive-tinted. Near Marietta, Washington County. P. L. Cole's quarry. Tenth Census, 1880. 26639.

Sandstone. Sub-Carboniferous; gray. Near Marietta, Washington County. P. L. Cole's quarry. Tenth Census, 1880. 26640.

—— Sub-Carboniferous; light colored. Harmer, Washington County. T. B. Townsend's quarry. Tenth Census, 1880. 26680.

—— Carboniferous; dark gray. Near Marietta, Washington County. D. B. Calder's quarry. Tenth Census, 1880. 26681.

—— Carboniferous; fine; gray. Near Marietta, Washington County. D. Brigg's quarry. Tenth Census, 1880. 26697.

—— Carboniferous; fine; gray. Near Marietta, Washington County. Constitution Stone Company. Tenth Census, 1880. 26741.

—— Carboniferous; fine; light brown. Near Constitution, Washington County. Constitution Stone Company. Tenth Census, 1880. 26742.

—— Carboniferous; fine; gray. Near Marietta, Washington County. C. Finch's quarry. Tenth Census, 1880. 26762.

—— Sub-Carboniferous; fine; brown. Piketon, Pike County. Waverly Brownstone Quarry. Tenth Census, 1880. 25834.

—— Sub-Carboniferous; fine; very light gray. Piketon, Pike County. Green Quarry. Tenth Census, 1880. 25756.

—— Sub-Carboniferous; fine; light brown. Rockville, Adams County. Rockville Freestone Works. Tenth Census, 1880. 25754.

— Sub-Carboniferous; fine; very light gray. Near Portsmouth, Scioto County. Quarry of Reitz & Co. Tenth Census, 1880. 25751.

—— Sub-Carboniferous; fine; drab. Near Portsmouth, Scioto County. Quarry of Reitz & Co. Tenth Census, 1880. 25752.

—— Sub-Carboniferous; fine; drab. Buena Vista, Scioto County. Buena Vista Freestone Company. Tenth Census, 1880. 25753.

—— Sub-Carboniferous; fine; drab. Buena Vista and Scioto Counties. Buena Vista Excelsior Freestone Works. Tenth Census, 1880. 25755.

OREGON.

Diabase. Medium; gray. Twenty miles east of Albany, Linn County. F. Wood's quarry. Frank Wood, 1885. 37006.

Basalt. Fine; gray. Near Clackamas, Clackamas County. William Young's quarry. Tenth Census, 1880. 26249.

Sandstone. Fine; drab. Oakland, Douglas County. W. N. Leeper's quarry. Tenth Census, 1880. 26504.

—— Fine; very light brown. Near Albany, Linn County. F. Wood's quarry. Frank Wood, 1885. 37005.

PENNSYLVANIA.

Serpentine. Light green; coarse; porous. Will not polish; used only for general building. West Chester, Chester County. J. H. Brinton's quarry. Tenth Census, 1880. 25592.

—— Light green; coarse; porous. Will not polish; used only for general building. Three miles south of West Chester, Chester County. J. H. Brinton's quarry. Tenth Census, 1880. 27319.

—— Light green; coarse; porous. Will not polish; used only for general building. Chester County (near Rising Sun, Md.). Carter & Reynolds's quarries. Tenth Census, 1880. 25668.

Limestone. Lower Silurian; blue-gray; micaceous. East Conshohocken, Montgomery County. American Society Mining Engineers, 1886. 37873.

Limestone. Dark blue-gray; fine and compact. Mertztown, Berks County. American Society Mining Engineers, 1886. 37879.

—— Lower Silurian; dark blue-gray. Wernersville, Berks County. American Society Mining Engineers, 1886. 37861.

—— Lower Silurian; dark blue-gray. Wernersville, Berks County. American Society Mining Engineers, 1886. 37855.

—— Lower Silurian; water-blue, dark veined. Wernersville, Berks County. American Society Mining Engineers, 1886. 37854.

—— Lower Silurian; fine; blue-gray. Myerstown, Lebanon County. American Society Mining Engineers, 1886. 37864.

—— Lower Silurian; Myerstown, Lebanon County. American Society Mining Engineers, 1886. 37863.

—— Lower Silurian; dark blue-gray. North of Annville, Lebanon County. American Society Mining Engineers, 1886. 37867.

—— Lower Silurian; dark blue-gray. Palmyra, Lebanon County. American Society Mining Engineers, 1886. 37871.

—— Lower Silurian; blue-gray, white spotted. North of Annville, Lebanon County. American Society Mining Engineers, 1886. 37852.

—— Lower Silurian; dark blue-gray. North of Annville, Lebanon County. American Society Mining Engineers, 1886. 37887.

—— Lower Silurian; blue-gray. Richland Station, Lebanon County. American Society Mining Engineers, 1886. 37874.

—— Lower Silurian; water-blue; crystalline. Richland Station, Lebanon County. American Society Mining Engineers, 1886. 37865.

—— Lower Silurian; blue-gray; crystalline. Richland Station, Lebanon County. American Society Mining Engineers, 1886. 37866.

—— Lower Silurian; dark blue-gray. Harrisburg, Dauphin County. American Society Mining Engineers, 1886. 37878.

—— Lower Silurian; dark blue-gray, nearly black; fine and compact. Near Harrisburg, Dauphin County. J. A. Rutherford's quarry. Tenth Census, 1880. 25328.

—— Lower Silurian; blue. Hummelstown, Dauphin County. American Society Mining Engineers, 1886. 37883.

—— Lower Silurian; dark blue-gray, nearly black. Paxton Station, Dauphin County. American Society Mining Engineers, 1886. 37870.

—— Lower Silurian; nearly black; fine and compact. Near York, York County. C. F. Winters's quarry. Tenth Census, 1880. 26237.

—— Lower Silurian; dark gray, nearly black; fine and compact. Chambersburgh, Franklin County. Henry Lippy's quarry. Tenth Census, 1880. 26312.

—— Sub-Carboniferous; light gray; granular. Connellsville, Fayette County. A R. Banning's quarry. Tenth Census, 1880. 26058.

—— Devonian; very dark drab; fine and compact. Near Huntingdon, Huntingdon County. F. Hefright's quarry. Tenth Census, 1880. 26170.

—— Very dark gray; fine and compact. Near Spruce Creek, Huntingdon County. Robert Henderson's quarry. Tenth Census, 1880. 26235.

—— Lower Silurian; water-blue; crystalline. Howellsville, Delaware County. American Society Mining Engineers, 1886. 37869.

—— Lower Silurian; nearly white; crystalline. Howellsville, Delaware County. American Society Mining Engineers, 1886. 37853.

—— Lower Silurian; dark blue-gray. Lebanon, Allegheny County. American Society Mining Engineers, 1886. 37858.

Limestone. Lower Silurian; dark blue-gray. Lebanon, Allegheny County. American Society Mining Engineers, 1886. 37859.

—— Lower Silurian; dark blue-gray. Lebanon, Allegheny County. American Society Mining Engineers, 1886. 37860.

—— Lower Silurian; dark blue-gray. Schuylkill Haven, Schuylkill County. American Society Mining Engineers, 1886. 37872.

Calcareous dolomite. Lower Silurian; gray; granular. Two specimens. Near Columbia, Lancaster County. C. S. Kauffman's quarry. Tenth Census, 1880. 26331.

—— Lower Silurian; nearly black; pyritiferous. Leamon Place Station, Lancaster County. J. Young's quarry. Tenth Census, 1880. 25666.

—— Lower Silurian; dark; nearly black. Reading, Berks County. John H. Sternburg's quarry. Tenth Census, 1880. 26437.

—— Lower Silurian. Wrightsville, York County. Quarry of Kerr, Weitzel & Co. Tenth Census, 1880. 26332.

—— Lower Silurian; dark gray; nearly black; fine and compact. Carlisle, Cumberland County. W. F. Noble's quarry. Tenth Census, 1880. 26302.

—— Lower Silurian; gray; coarsely laminated. Near Shiremanstown, Cumberland County. Quarry of Moses & Sidle. Tenth Census, 1880. 26301.

Dolomite. Lower Silurian; black; fine and compact. Easton, Northampton County. Quarry of George & Isaac A. Smith. Tenth Census, 1880. 25767.

—— Lower Silurian; yellowish. Two specimens. Flourtown, Montgomery County. American Society Mining Engineers, 1886. 37876.

—— Lower Silurian; light yellow, blue spotted. Flourtown, Montgomery County. American Society Mining Engineers, 1886. 37884.

—— Lower Silurian; bluish drab; compact. Philadelphia and Reading Railroad, Chester Valley Branch, McInnes Siding, Chester County. American Society Mining Engineers, 1886. 37857.

—— Lower Silurian; light colored. Mill Lane, Chester County. American Society Mining Engineers, 1886. 37868.

—— Lower Silurian; blue mottled. Near Pott's Landing, Berks County. American Society Mining Engineers, 1886. 37856.

—— Lower Silurian; Light yellow; fine and compact. Williams Station, Berks County. American Society Mining Engineers, 1886. 37886.

—— Lower Silurian; dark blue-gray; fine and compact. Near Lancaster, Lancaster County. Westman's quarry. Tenth Census, 1880. 26374.

—— Lower Silurian; dark blue-gray; fine and compact. Near Harrisburg, Dauphin County. Quarry of McCormick & Co. Tenth Census, 1880. 26281.

—— Lower Silurian; dark gray; fine and compact. Near Orbisonia, Huntingdon County. Quarry of D. Grove & Son. Tenth Census, 1880. 26204.

—— Lower Silurian; fine; light yellow. Kerberburgh. American Society Mining Engineers, 1886. 37877.

—— Lower Silurian; light drab. Plymouth, Luzerne County. American Society Mining Engineers, 1886. 37880.

—— Lower Silurian; light colored; crystalline. Cedar Hollow, Lime County. American Society Mining Engineers, 1886. 37885

Limestone [marble]. Lower Silurian; nearly white; fine grained; compact. Morristown, Montgomery County Centennial, 1876. 17573.

—— Lower Silurian: light gray; crystalline. Two specimens. Near Spring Mill Station, Montgomery County. Cedar Grove Marble Works. Tenth Census, 1880 25356

Limestone [marble]. Lower Silurian; light blue-gray; crystalline; King of Prussia, Montgomery County. Reeseville Blue Marble Company. Tenth Census, 1880. 25555.

—— Light blue-gray; crystalline. Near Columbia, Lancaster County. C. S. Kauffman's quarry. Tenth Census. 26331.

—— Bluish white; pink veins; fine; compact; crystalline. York, York County. C. H. Smith's quarry. Tenth Census, 1880. 26236.

—— Lower Silurian; dark gray. Pine Grove, Schuylkill County. American Society Mining Engineers, 1886. 37875.

—— Lower Silurian; gray; dark veined; white spotted; fine and compact. Myerstown, Lebanon County. American Society Mining Engineers, 1886. 37862.

—— Lower Silurian. Gray; dark veined; fine and compact. American Society Mining Engineers. 37863.

—— Lower Silurian; dark blue-gray. North of Annville, Lebanon County. American Society Mining Engineers, 1886. 37881.

Magnesian limestone. Lower Silurian very dark gray; fossiliferous. Morrell, Huntingdon County. Quarry of A. G. Morris. Tenth Census, 1880. 26162.

—— Lower Silurian; dark gray; coarse. East Conshohocken, Montgomery County. East Conshohocken quarry. Tenth Census, 1880. 26983.

—— Devonian; dark gray; fine and compact. Two specimens. Hyndman, Bedford County. Peerless Lime Company. Tenth Census, 1880. 26201.

—— Devonian; drab; semi-crystalline; fossiliferous. Cove Station, Bedford County. J. T. Shirley's quarry. Tenth Census, 1880. 26202.

—— Carboniferous; dark drab; coarse. Two specimens. Van Port, Beaver County. W. J. Dunn's quarry. Tenth Census, 1880. 25846.

Calcareous breccia. Triassic; coarse; variegated. Near Fairfield, Adams County. Tenth Census, 1880. 26376.

Calcareous breccia [marble]. Triassic; coarse; reddish; variegated. Near Fairfield, Adams County. Tenth Census, 1880. 26376.

—— Triassic; coarse; variegated. Near Amityville, Berks County. Col. J. Weaver's quarry. Tenth Census, 1880. 26465.

Calcareous dolomite. [marble]. Lower Silurian; nearly white; crystalline. Near Columbia, Lancaster County. Quarry of Kerr, Weitzel & Co. Tenth Census, 1880. 26332.

Biotite gneiss Coarse; gray. Near Chester, Delaware County. Crum Creek quarry Tenth Census, 1880. 25404.

—— Fine; gray. Two specimens. Near Chester, Delaware County. Quarry of Leiper & Lewis. Tenth Census, 1880. 25407.

—— Fine; gray. Frankford, Philadelphia County. Quarry of Barbour, Ireland & S. Faunce. Tenth Census, 1880. 25561.

Biotite muscovite gneiss. Fine; light gray. Near Chester, Delaware County. quarry of A. O. & I. O. Deshong, jr. Tenth Census, 1880. 25436.

Gneiss. Coarse; gray. Near Reading, Berks County. Tenth Census, 1880. 26470.

Muscovite gneiss. Coarse; very light gray. Germantown, Twenty-second Ward, Philadelphia County. J. Nolan's quarry. Tenth Census, 1880. 25669.

Hornblende gneiss. Fine; dark gray. Germantown, Philadelphia County. Quarry of Nester & Shelmire. Tenth Census, 1880. 25551.

—— Fine; dark gray. Rittenhousetown, Philadelphia County. McKinney's quarry. Tenth Census, 1880. 25556.

Quartz porphyry. Dull red. Near Pine Grove Furnace, Cumberland County. Tenth Census, 1880. 26382

Diabase. Nearly black; fine and compact. Near Reading, Berks County. Tenth Census, 1880. 26467.

—— Coarse; dark gray. Little Dam, near Reading, Berks County. Used for street pavements. Tenth Census, 1880. 26476.

—— Fine; dark gray. Used as above. Near Jacksonwald, Berks County. Tenth Census, 1880. 26479.

—— Mesozoic; medium; gray. Used as above. Round Top, 3 miles south of Gettysburgh, Adams County. Tenth Census. 26375.

—— Mesozoic; fine; gray. Near Goldsborough, York County. Used as above. Northern Central Railroad Company. Tenth Census, 1880. 26282.

—— Mesozoic; fine; gray. Collins Station, Lancaster County. Used chiefly for street pavement and road ballast. J. Keller's quarry. Tenth Census, 1880. 25327.

Diorite. Medium; dark gray. Near Reading, Berks County. Ohlinger Dam Cut. Tenth Census, 1880. 26466.

—— Coarse; dark gray. Reading, Berks County. Tenth Census, 1880. 26474.

Sandstone. Sub-Carboniferous; fine; light colored. Corry, Erie County. J. M. Colegrove's quarry. Tenth Census, 1880. 25890.

—— Devonian; fine; light colored. Lebœuf, Erie County. F. Sanger's quarry. Tenth Census, 1880. 25738.

—— Devonian; fine; drab. Near Erie, Erie County. J. Leask's quarry. Tenth Census, 1880. 25739.

—— Carboniferous; coarse; light colored. Meadville, Crawford County. B. McNeil's quarry. Tenth Census, 1880. 25772.

—— Carboniferous; fine; light colored. Titusville, Crawford County. D. Brennan's quarry. Tenth Census, 1880. 25850.

—— Carboniferous; fine; light colored. Near Warren, Warren County. W. Smith's quarry. Tenth Census, 1880. 26523.

—— Carboniferous; fine; very light brown. North Warren, Warren County. Tenth Census, 1880. 25888.

—— Carboniferous; light colored; medium. Garland, Warren County. Quarry of Linn & Leary. Tenth Census, 1880. 25889.

—— Carboniferous; coarse; cellular; light colored. Antrim, Tioga County. P. Bradley's quarry. Tenth Census, 1880. 25988.

—— Devonian; fine; blue-gray. Mainesburgh, Tioga County. Mainesburgh Flagging Company. Tenth Census, 1880. 25989.

—— Carboniferous; fine; light gray. Greenville, Mercer County. Quarry of Amy & Kappenberger. Tenth Census, 1880. 25773.

—— Carboniferous; fine; very light olive. Greenville, Mercer County. P. Leech's quarry. Tenth Census, 1880. 25774.

—— Carboniferous; fine; light colored. Sharon, Mercer County. C. Herrmann's quarry. Tenth Census, 1880. 25775.

—— Sub-Carboniferous; fine; gray and light brown. Two specimens. Franklin, Venango County. Quarry of J. Bell & Son. Tenth Census, 1880. 25848.

—— Carboniferous; fine; light buff. Rockwood, Venango County. D. Ready's quarry. Tenth Census, 1880. 25849.

—— Carboniferous; coarse; light colored. Iowa Station, Jefferson County. Allegheny Valley Railroad Company. Tenth Census, 1880. 25915.

—— Devonian; brown; fine and compact. Queen's Run, Clinton County. J. McNally's quarry. Tenth Census. 1880. 25948.

Sandstone. Devonian; fine; buff. Farrandsville, Clinton County. Quarry of H. F. Hawk & Co. Tenth Census, 1880. 25961.

—— Upper Silurian; dark blue-gray; very fine and compact. Near Danville, Montour County. Pinneo estates. Tenth Census, 1880. 25962.

—— Devonian; very fine; light blue-gray. Near Nicholson, Wyoming County. Quarry of Moses Shields & Son. Tenth Census, 1880. 27020.

—— Devonian; fine; blue-gray. Two specimens. Black Walnut, Wyoming County. Wyoming Stone Company. Tenth Census, 1880. 27032.

—— Devonian; fine; light blue-gray. Skinner's Eddy, Wyoming County. Quarry of A. R. Fordyce & Co. Tenth Census, 1880. 27033.

—— Devonian; fine; light blue-gray. Meshoppen, Wyoming County. Quarry of Brownscombe & King. Tenth Census, 1880. 27037.

—— Devonian; fine; dark purplish. Plains, Luzerne County. P. Banker's quarry Tenth Census, 1880. 27039.

—— Carboniferous; fine; gray. Shickshinny, Luzerne County. G. Niceley's quarry. Tenth Census, 1880. 25960.

—— Devonian; fine; blue-gray. Braudt, Susquehanna County. Harmony Brick Company. Tenth Census, 1880. 27016.

—— Sub-Carboniferous; fine; gray. Near Scranton, Lackawanna County. Quarry of J. Williams. Tenth Census, 1880. 27017.

—— Devonian; fine; light colored. Near Scranton, Lackawanna County. Quarry of J. Williams. Tenth Census, 1880. 27018.

—— Coarse; pink. Olyphant, Lackawanna County. Olyphant quarry. Tenth Census, 1880. 27019.

—— Devonian; fine; dark blue-gray. Pond Eddy, Pike County. Quarry of C. W. Maxwell & Co. Tenth Census, 1880. 27015.

—— Carboniferous; light colored. Homewood, Beaver County. Quarry of Richie & McGinnis. Tenth Census, 1880. 25258.

—— Carboniferous; light colored and brown. Two specimens. Homewood, Beaver County. A. J. Jolly's quarry. Tenth Census, 1880. 25259.

—— Carboniferous; fine; light colored. Near Beaver Falls, Beaver County. Quarry of J. Harlman & D. Bernard. Tenth Census, 1880. 25355.

—— Carboniferous; coarse; gray. Kiasola Station, Beaver County. Quarry of Reed & Ewing. Tenth Census, 1880. 25260.

—— Carboniferous; coarse; gray; rust spotted. Baden, Beaver County. J. G. Gallagher's quarry. Tenth Census, 1880. 25261.

—— Devonian; fine; dark brown. Schuylkill Haven, Schuylkill County. Tenth Census, 1880. 25779.

—— Lower Silurian; coarse; gray. Near Pottsville, Schuylkill County. Tenth Census, 1880. 25780.

—— Carboniferous; coarse; gray. Mauch Chunk, Carbon County. Tenth Census, 1880. 25858.

—— Devonian; fine; dark gray. Mauch Chunk, Carbon County. Tenth Census, 1880. 25854.

—— Devonian; fine; brown. Mauch Chunk, Carbon County. Tenth Census, 1880. 25855.

—— Lower Silurian; coarse; brownish. Mauch Chunk, Carbon County. Tenth Census, 1880. 25856.

—— Devonian; fine; blue-gray. Weissport, Carbon County. H. Mertz's quarry. Tenth Census, 1880. 27013

Sandstone. Carboniferous; fine; olive. Pittsburgh, Allegheny County. T. Rourke's quarry. Tenth Census, 1880. 25768.

—— Carboniferous; fine; light-gray. Johnstown, Cambria County. Quarry of Gore & Levergood. Tenth Census, 1880. 26121.

—— Carboniferous; fine; gray. Prospect, Cambria County. Cambria Iron Company. Tenth Census, 1880. 25922.

—— Sub-Carboniferous; fine; light colored. Near Altoona, Blair County. William Myer's quarry. Tenth Census, 1880, 26148.

—— Upper Silurian; very light colored; compact and hard. Near Mapleton, Huntingdon County. F. Hefright's quarry. Tenth Census, 1880. 26171.

—— Triassic; coarse; porous; reddish brown. Norristown, Montgomery County. L. Flum's quarry. Tenth Census, 1880. 26433.

—— Triassic; purplish brown; fine and medium. Two specimens. Near Reading, Berks County. Quarry of Eppler & Rischvile. Tenth Census, 1880. 26436.

—— Potsdam; light colored; compact and hard. Reading, Berks County. Tenth Census, 1880. 26471.

—— Triassic; fine; light reddish brown. Centre Bridge, Bucks County. A. Manderson's quarry. Tenth Census, 1880. 25837.

—— Triassic; coarse; light bluish drab, rust spotted. Centre Bridge, Bucks County. A. Manderson's quarry. Tenth Census, 1880. 25838.

—— Triassic; reddish gray, rust spotted. Centre Bridge, Bucks County. A. Manderson's quarry. Tenth Census, 1880. 25839.

—— Carboniferous; brown; medium. Near Wampum, Lawrence County. J. Friday's quarry. Tenth Census, 1880. 25852.

—— Carboniferous; light colored; medium. Near Wampum, Lawrence County. Quarry of New York, Pittsburgh and Chicago Railroad Company. Tenth Census, 1880. 25853.

—— Carboniferous; fine; light colored. Wampum, Lawrence County. J. Friday's quarry. Tenth Census, 1880. 25776.

—— Carboniferous; coarse; porous; light colored. Freeport, Armstrong County. D. Taylor's quarry. Tenth Census, 1880. 25851.

—— Triassic; fine; reddish brown. Centre Bridge, Bucks County. A. Manderson's quarry. Tenth Census, 1880. 25836.

—— Triassic; light brown; porous. Two specimens. Yardleyville, Bucks County. Quarry of S. B. & E. W. Twinning. Tenth Census, 1880. 25667.

—— Triassic; fine; brown. Two specimens. Lumberville, Bucks County. T. H. Kemble's quarry. Tenth Census, 1880. 25676.

—— Carboniferous; coarse; buff. Two specimens. Waynesburgh, Greene County. S. Rinehart's quarry. Tenth Census. 1880. 25769.

—— Carboniferous; fine; bluish drab. Near Cannonsburgh, Washington County. J. Cook's quarry. Tenth Census, 1880. 25845.

—— Carboniferous; coarse; light colored. Near Monongahela City, Washington County. Tenth Census, 1880. 25239.

—— Carboniferous; light yellowish brown. Near Washington, Washington County. Quarry of Hallam Bros. Tenth Census, 1880. 25770.

—— Carboniferous; light yellowish brown. Near Washington, Washington County. D. Haggerty's quarry. Tenth Census, 1880. 25771.

—— Carboniferous; fine; gray. Near Webster, Westmoreland County. William Nelson's quarry. Tenth Census, 1880. 25353.

—— Carboniferous; fine; gray. Greensburgh, Westmoreland County. S. Zimmerman's quarry. Tenth Census, 1880. 25924.

Sandstone. Carboniferous; fine; gray, dark streaked. Lucesco, Westmoreland County. J. A. Huffman's quarry. Tenth Census, 1880. 25903.

—— Carboniferous; fine; bluish gray. Derry Station, Westmoreland County. Loyalhanna Coal and Coke Company. Tenth Census, 1880. 25913.

—— Carboniferous; buff; medium. Derry Station, Westmoreland County. J. C. Campbell's quarry. Tenth Census, 1880. 25914.

—— Carboniferous; fine; brown and brown with yellow bands. Two specimens. Scottdale, Westmoreland County. S. Dunmire's quarry. Tenth Census, 1880. 25985.

—— Carboniferous; coarse; buff. Near Uniontown, Fayette County. J. Fraser's quarry. Tenth Census, 1880. 25990.

—— Sub-Carboniferous; fine; light colored. Near Uniontown, Fayette County. D. Shipley's quarry. Tenth Census, 1880. 25991.

—— Sub-Carboniferous; fine; light reddish gray. Near Uniontown, Fayette County. D. Shipley's quarry. Tenth Census, 1880. 25992.

—— Carboniferous; fine; light colored. Near Connellsville, Fayette County. Speer White & Co. Tenth Census, 1880. 26059.

—— Carboniferous; medium; light colored. Connellsville, Fayette County. C. Shibley's quarry. Tenth Census, 1880. 25984.

—— Carboniferous; fine; light colored. Layton's Station, Fayette County. Speer White & Co. Tenth Census, 1880. 26060.

—— Carboniferous; fine; light colored. Fayette Station, Fayette County. Quarry of Porter Bros. Tenth Census, 1880. 26061.

—— Carboniferous; fine; light drab. Somerset, Somerset County. J. McAdam's quarry. Tenth Census, 1880. 26109.

—— Triassic; fine; brown. Used for general building. Goldsborough, York County, Hummelstown Brownstone Company. Tenth Census, 1880. 25265.

—— Triassic; reddish brown. Used as above. Near Hummelstown, Dauphin County. Hummelstown Brownstone Company. Tenth Census, 1880. 25266.

—— Triassic; fine; brown. Near Goldsborough, York County. F. Reiling's quarry. Tenth Census, 1880. 26283.

Argillaceous sandstone. Carboniferous; fine; gray. Stoops Ferry, Allegheny County. U. S. Government quarry. Tenth Census, 1880. 25342.

Conglomerate. Devonian; coarse; light colored. Pottsville, Schuykill County. Tenth Census, 1880. 27049.

—— Potsdam; coarse; friable. Friedensburg, Berks County. Clymer quarry Tenth Census, 1880. 26468.

—— Potsdam; pinkish gray; compact. Near Pikeville, Berks County. G. M. Keim's quarry. Tenth Census, 1880. 26469.

—— Sub-Carboniferous; gray; compact. Pottsville, Schuylkill County. Tenth Census, 1880. 25782.

Quartzite. Devonian; fine; light colored. Near Altoona, Blair County. Quarry of Booth & Mackey. Tenth Census, 1880. 26147.

—— Potsdam; light colored; compact and hard. Jacksonwald, Berks County. Tenth Census, 1880. 26473.

—— Upper Silurian; very light colored; compact and hard. Near Huntingdon, Huntingdon County. S. P. Wensel's quarry. Tenth Census, 1880. 26203.

Sandstone (nearly quartzite). Carboniferous; blue-gray; very compact and hard. Near Shickshinny, Luzerne County. Delaware, Lackawanna and Western Railroad quarry. Tenth Census, 1880. 25923.

Slate. Lower Silurian (Hudson River). Blue-black. Slatington, Lehigh County. Quarry of D. Williams. Tenth Census, 1880. 25740.

Slate. Lower Silurian. Blue-black. 4 by 4 by 3 inches. Chapman's Station, Northampton County. Chapman's New York Slate Company. Tenth Census, 1880. 25820.

—— Lower Silurian. Blue-black. Bangor, Northampton County. Bangor Slate Company. Tenth Census, 1880. 25934.

—— Lower Silurian. Blue-black. Slatedale, Lehigh County. Quarries of the Lock Slate Company. Tenth Census, 1880. 25959.

—— Lower Silurian. Blue-black. 4 by 4 by 2½ inches. Catasauqua, Lehigh County. Tenth Census, 1880. 25993.

—— Lower Silurian. Blue-black and brownish. Three specimens. Bangor, Northampton County. Bangor Slate Company. Tenth Census, 1880. 25934.

—— Lower Silurian. Blue-black. Slatington, Lehigh County. Quarry of Kuntz & Jacobs. Tenth Census, 1880. 26912.

—— Lower Silurian. Blue-black. Slatington, Lehigh County. Quarry of J. Hess & Co. Tenth Census, 1880. 26913.

—— Lower Silurian. Blue-black. Two specimens. Slatington, Lehigh County. Pennsylvania quarries. Tenth Census, 1880. 26914.

—— Archæan (?) Blue-black. Bangor, York County. Peach Bottom Slate Company. Tenth Census, 1880. 25949.

—— Archæan (?) Blue-black. Slab 8 inches square. West Bangor, York County. Quarry of R. L. Jones & Co. Tenth Census, 1880. 26480.

—— Archæan (?) Blue-black. 4 by 4 by 1½ inches. West Bangor, York County. Quarry of W. C. Parry & Co. Tenth Census, 1880. 26852.

—— Archæan (?) Blue-black. Slab 8 inches square. West Bangor, York County. Quarry of W. C. Parry & Co. Tenth Census, 1880. 26853.

RHODE ISLAND.

Biotite granite. Fine; gray. Near Westerly, Washington County. Smith Granite Company. Tenth Census, 1880. 25491.

—— Medium; light pink. Near Westerly, Washington County. Smith Granite Company. Tenth Census, 1880. 25492.

—— Fine; gray. Near Westerly, Washington County. New England Granite Works. Tenth Census, 1880. 25510.

—— Fine; gray. Near Westerly, Washington County. New England Granite Works. Tenth Census, 1880. 25511.

—— Fine; gray. Foot cube. Westerly, Washington County. Centennial, 1876. 17526.

—— Fine; pink. Westerly, Washington County. Centennial, 1876. 17553.

—— Fine; gray. Near Westerly, Washington County. Smith Granite Company. Tenth Census, 1880. 25490.

—— Medium; gray. Near Westerly, Washington County. C. P. Chapman's quarry. Tenth Census, 1880. 25529.

—— Fine; pink. Near Westerly, Washington County. C. P. Chapman's quarry. Tenth Census, 1880. 25530.

—— Medium; pink. Near Westerly, Washington County. New England Granite Works. Tenth Census, 1880. 25512.

—— Fine; gray. Near Westerly, Washington County. C. P. Chapman's quarry. Tenth Census, 1880. 25528.

—— Medium; pink. Six-inch cube. Westerly, Washington County. New England Granite Works. Tenth Census, 1880. 26998.

—— Fine; gray. Six-inch cube. Westerly, Washington County. New England Granite Works. Tenth Census, 1880. 26999.

Biotite granite. Fine; gray. Six-inch cube. Westerly, Washington County. New England Granite Works. Tenth Census, 1880. 27000.

—— Fine; gray. Niantic, Washington County. A. G. Crumb's quarry. Tenth Census, 1880. 25952.

—— Coarse; light pink. West Greenwich, Kent County. H. Vaughn's quarry. Tenth Census, 1880. 25513.

—— Coarse; pinkish gray. West Greenwich, Kent County. J. Tarbox's quarry. Tenth Census, 1880. 25514.

—— Coarse; light pinkish gray. Near Smithfield, Providence County. Smithfield Granite Company. Tenth Census, 1880. 25531.

Granite. Fine; light gray. Polished slab 7 feet 5 inches long by 3 feet 8 inches wide by 2½ inches thick. Westerly, Washington County. New England Granite Company. Tenth Census, 1880. 27063.

Biotite gneiss. Coarse; light gray. Pascoag, Providence County. Quarry of Garvey Bros. Tenth Census, 1880. 26318.

Hornblende gneiss. Medium; dark greenish gray. Diamond Hill, Cumberland Township, Providence County. Tenth Census, 1880. 25532.

SOUTH CAROLINA.

Steatite (?) [soapstone]. Very compact and quite hard; nearly black. Quarry of F. Happenfield, Yorkville, York County. Centennial, 1876. 39019.

—— Medium; greenish gray. Spartanburgh, Spartanburgh County, 1885. 37590.

Limestone [marble]. Light blue-gray; crystalline. 37591.

Biotite granite. Medium; gray. Winnsborough, Fairfield County. 37578.

—— Fine; gray. Fairfield County. 37588.

—— Medium; gray. Fairfield County. 37587.

—— Fine; gray. Charleston, Charleston County. E. R. White, 1885. 37583.

—— Fine; gray. Aiken County. 37585.

—— Coarse; dark gray. Aiken County. 37601.

—— Medium; dark gray. Batesburgh, Lexington County. 37584.

—— Medium; gray. Columbia, Richland County. 37582.

—— Fine; gray. Edgefield County. 37586.

—— Fine; gray. Newburry County. 37589.

TENNESSEE.

Limestone [marble]. Lower Silurian; pink; fossiliferous. Slab 12 by 10 by ½ inches. R. Gouldsbury & Son, New York, 1884. 36760.

—— Lower Silurian; pink; crystalline. Near Cleveland, Bradley County. Quarry of Patrick & Smith. Tenth Census, 1880. 26825.

—— Lower Silurian; pink; fossiliferous. Near Cleveland, Bradley County. Quarry of Patrick & Smith. Tenth Census, 1880. 26824.

—— Lower Silurian; dull red and white mottled; fossiliferous. Near Whitesburgh, Hamblen County. Joseph Stamp's quarry. Tenth Census, 1880. 25995.

—— Lower Silurian; olive-green; fossiliferous. Eleventh district of Davidson County. N. H. Boyd's quarry. Tenth Census, 1880. 27186.

—— Lower Silurian; very light gray; crystalline. Two specimens. Knoxville, Knox County. Quarry of Frierson & Morgan. Tenth Census, 1880. 26555.

—— Lower Silurian; light pink; crystalline. Knoxville, Knox County. Crescent quarry. Tenth Census, 1880. 26556.

—— Lower Silurian; pink; crystalline. Knoxville, Knox County. Crescent quarry. Tenth Census, 1880. 26557.

Limestone [marble]. Lower Silurian; pink; crystalline. Near Knoxville, Knox County. Knoxville Marble Company. Tenth Census, 1880. 26558.

—— Lower Silurian; pink; crystalline. Knoxville, Knox County. Quarry of John M. Ross. Tenth Census, 1880. 26209.

—— Lower Silurian; dull pink; crystalline. Near Knoxville, Knox County. Quarry of J. M. Ross. Tenth Census, 1880. 26975.

—— Lower Silurian; light pink; crystalline. Near Knoxville, Knox County. Tennessee River Marble Company. Tenth Census, 1880. 26653.

—— Lower Silurian; red and white mottled; fossiliferous. Near Knoxville, Knox County. Tennessee River Marble Company. Tenth Census, 1880. 26654.

—— Lower Silurian; pink; crystalline. 12-inch cube. Knoxville, Knox County. Knoxville Marble Company. 17450.

—— Lower Silurian; pinkish drab with dark veins; crystalline. About 10 by 10 by 2½ inches. Knoxville, Knox County. Knoxville Marble Company. Centennial, 1876. 17480.

—— Lower Silurian; red and white mottled; fossiliferous. Knoxville, Knox County. Rosebud quarry. Tenth Census, 1880. 26559.

—— Lower Silurian; pink; crystalline. Knoxville, Knox County. Knoxville Marble Company. Tenth Census, 1880. 26627.

—— Reddish brown; fossiliferous. Third civil district, Knox County. Quarry of Harvey & Brown. T. Toumey, 1881. 25242.

—— Lower Silurian; dull red; variegated; fossiliferous. Slab 24 by 21 by 1½ inches. Quarryville, Hawkins County. Centennial, 1876. 25253.

—— Lower Silurian; red and white mottled; fossiliferous. 12-inch cube. Quarryville, Hawkins County. Dougherty Marble quarry. Centennial, 1876. 17452.

—— Lower Silurian; red and white mottled; fossiliferous. 12-inch cube. Doughertyville, Hawkins County. Centennial, 1876. 17453.

—— Lower Silurian; dull red; variegated; semi-crystalline; fossiliferous. Doughertyville, Hawkins County. Col. Edward Clark, 1880. 25094.

—— Lower Silurian; red and white mottled; fossiliferous. 12-inch cube. Doughertyville, Hawkins County. Centennial, 1876. 25240.

—— Lower Silurian; dull red and white mottled; fossiliferous. Rogersville, Hawkins County. J. Hasson's quarry. Tenth Census, 1880. 25330.

—— Lower Silurian; dull red and white mottled; fossiliferous. Rogersville, Hawkins County. John Hasson's quarry. Tenth Census, 1880. 25338.

—— Lower Silurian; red and white mottled; fossiliferous. Rogersville, Hawkins County. Quarry of Chesnut & Chesnut.. Tenth Census, 1880. 26211.

—— Lower Silurian; red and white mottled; fossiliferous. Near Rogersville, Hawkins County. J. Price's quarry. Tenth Census, 1880. 26652.

—— Lower Silurian; red and white mottled; fossiliferous. Near Rogersville, Hawkins County. J. Wright's quarry. Tenth Census, 1880. 26805.

—— Lower Silurian; red and white mottled; fossiliferous. Two specimens. Near Rogersville, Hawkins County. Cole's Ridge quarry. Tenth Census, 1880. 26937.

—— Lower Silurian; red and white mottled; fossiliferous. Two specimens. Mooresburgh, Hawkins County. E. D. Dougherty's quarry. Tenth Census, 1880. 26916.

Magnesian limestone [marble]. Lower Silurian; pink; crystalline. Two specimens, light and dark. Cleveland, Bradley County. Quarry of Patrick & Smith. Tenth Census, 1880. 26560.

Magnesian limestone [marble]. Lower Silurian; red and white mottled; fossiliferous. Two specimens, light and dark. Knoxville, Knox County. Quarry of Thomas & Co. Tenth Census, 1880. 26210.

—— Lower Silurian; red and white mottled; fossiliferous. Rogersville, Hawkins County. Quarry of Fulkerson & Chesnutt. Tenth Census, 1880. 26172.

—— Lower Silurian; variegated; brecciated. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27169.

—— Lower Silurian; variegated; brecciated. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27170.

—— Lower Silurian; light variegated; fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27171.

—— Lower Silurian; light variegated; fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27172.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 37165.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27166.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27167.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27168.

Limestone. Light colored; finely fossiliferous. Twenty-fifth district of Davidson County. Quarry of Joseph Clus & Bro. Tenth Census, 1880. 27187.

—— Carter's Creek, Davidson County. Trehen's Farm. Tenth Census, 1880. 26785.

—— Dark blue-gray; compact; fossiliferous. Charlotte Pike, near Nashville, Davidson County. Tenth Census, 1880. 26787.

—— Dark gray; fossiliferous. Near Nashville, Davidson County. Tenth Census, 1880. 26978.

—— Lower Silurian; light colored; finely fossiliferous. Near Nashville, Davidson County. Capitol quarry. Tenth Census, 1880. 25538.

—— Light colored; coarsely vesicular through the weathering out of fossil shells. Nashville, Davidson County. Tenth Census, 1880. 26976.

—— Lower Silurian; drab; fossiliferous; cellular. Two specimens. Nashville, Davidson County. Vanderbilt quarries. Tenth Census, 1880. 25562.

—— Lower Silurian; drab; compact., Nashville, Davidson County. Vanderbilt quarries. Tenth Census, 1880. 25563.

—— Sub-Carboniferous; light colored; oolitic. Sherwood Station, Franklin County. Swan's quarry. Tenth Census, 1880. 25559.

—— Drab; finely fossiliferous. Near Cowan, Franklin County. Tenth Census, 1880. 26795.

—— Drab; with light spots. Nolensville Pike, Williamson County. Old quarry. Tenth Census, 1880. 26789.

—— Light colored; fine and compact. Nolensville, Williamson County. Tenth Census, 1880. 26965.

—— Light colored; semi-crystalline. Columbia, Maury County. Tenth Census, 1880. 26968.

—— Light colored; fossiliferous. Two specimens. Carter's Creek Station, Maury County. Tenth Census, 1880. 26967.

—— Dark drab; semi-crystalline. Lebanon Pike, Wilson County. Mrs. Nichol's quarry. Tenth Census, 1880. 25784.

Limestone. Dark drab; compact. Murfreesborough, Rutherford County. Tenth Census, 1880. 26788.

—— Dull red; fossiliferous. Near Springfield, Henry County. Burns's quarry. Tenth Census, 1880. 25564.

—— Light colored; semi-crystalline; compact. Near Morristown, Hamblen County. M. Carriger's quarry. Tenth Census, 1880. 25994.

—— Light colored; finely fossiliferous. Breen's quarry. Tenth Census, 1880. 26786.

Granite. Coarse; gray. Southeast part of Carter County. Tenth Census, 1880. 26777.

Hornblende gneiss (?). Medium; gray. Hiwassee Copper Mines, Monroe County. Tenth Census, 1880. 26793.

Diorite (?). Very compact; nearly black; coarsely porphyritic; with scattering crystals of white feldspar. Carter County. Tenth Census, 1880. 26791.

Sandstone. Fine; dark blue-gray. Carter's Creek, Davidson County. Tenth Census, 1880. 26785.

—— Bright yellow; soft and porous. Twelfth district of Davidson County. J. Sullivant's quarry. Tenth Census, 1880. 27185.

—— Red; very ferruginous; soft and porous. Ducktown, Polk County. Tenth Census, 1880. 26966.

—— Fine; light drab. Church Mountain, Grainger County. Tenth Census, 1880. 26794.

—— Medium; light colored and pinkish. Two specimens. Sewanee, Franklin County. Tenth Census, 1880. 26796.

—— Coarse; light brown; cellular. Parksville, Polk County. Tenth Census, 1880. 26835.

—— Fine; light colored rust spotted. Parksville, Polk County. Tenth Census, 1880. 26836.

Conglomerate. Gray pink spotted; very hard and compact. Wolf Creek, Cocke County. Tenth Census, 1880. 26775.

—— Cambrian; greenish gray; fine; very hard and compact. Ocoee River, Polk County. Tenth Census, 1880. 26833.

—— Cambrian; gray; very hard and compact. Owen's Bluff on the Ocoee River, Polk County. Tenth Census, 1880. 26832.

Slate. Greenish. 4 by 4 by 3 inches. Near Ducktown, Polk County. Tenth Census, 1880. 26969.

TEXAS.

Limestone [marble]. Light yellow; compact; fossiliferous. Near Austin, Travis County. Quarry of C. W. Van Rosenbury. J. S. F. Batchen, 1884. 35576.

—— Cretaceous; drab; compact; coarsely fossiliferous. Austin, Travis County. J. McDonald's quarry. Tenth Census, 1880. 25716.

—— Lower Silurian; light drab, with purple veins; very fine and compact. Near Burnet, Burnet County. Holland's quarry. Tenth Census, 1880. 25720.

—— Lower Silurian; very light drab; fine and compact. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26692.

—— Blue-gray crystalline. Burnet, Burnet County. A. R. Johnson, 1887. 38819.

Dolomite [marble]. Dull red, with net-work of lighter lines. Burnet, Burnet County. A. R. Johnson, 1887. 38820.

Dolomite. Silurian; buff; fine and compact. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26272.

Magnesian limestone [marble]. Lower Silurian; red and white mottled; fossiliferous. Two specimens, light and dark. Knoxville, Knox County. Quarry of Thomas & Co. Tenth Census, 1880. 26210.

—— Lower Silurian; red and white mottled; fossiliferous. Rogersville, Hawkins County. Quarry of Fulkerson & Chesnutt. Tenth Census, 1880. 26172.

—— Lower Silurian; variegated; brecciated. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27169.

—— Lower Silurian; variegated; brecciated. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27170.

—— Lower Silurian; light variegated; fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27171.

—— Lower Silurian; light variegated; fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27172.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 37165.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27166.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27167.

—— Lower Silurian; pinkish drab; compact; finely fossiliferous. Near Calhoun, McMinn County. Hiwassee quarry No. 2. Tenth Census, 1880. 27168.

Limestone. Light colored; finely fossiliferous. Twenty-fifth district of Davidson County. Quarry of Joseph Clus & Bro. Tenth Census, 1880. 27187.

—— Carter's Creek, Davidson County. Trehen's Farm. Tenth Census, 1880. 26785.

—— Dark blue-gray; compact; fossiliferous. Charlotte Pike, near Nashville, Davidson County. Tenth Census, 1880. 26787.

—— Dark gray; fossiliferous. Near Nashville, Davidson County. Tenth Census, 1880. 26978.

—— Lower Silurian; light colored; finely fossiliferous. Near Nashville, Davidson County. Capitol quarry. Tenth Census, 1880. 25538.

—— Light colored; coarsely vesicular through the weathering out of fossil shells. Nashville, Davidson County. Tenth Census, 1880. 26976.

—— Lower Silurian; drab; fossiliferous; cellular. Two specimens. Nashville, Davidson County. Vanderbilt quarries. Tenth Census, 1880. 25562.

—— Lower Silurian; drab; compact. Nashville, Davidson County. Vanderbilt quarries. Tenth Census, 1880. 25563.

—— Sub-Carboniferous; light colored; oolitic. Sherwood Station, Franklin County. Swan's quarry. Tenth Census, 1880. 25559.

—— Drab; finely fossiliferous. Near Cowan, Franklin County. Tenth Census, 1880. 26795.

—— Drab; with light spots. Nolensville Pike, Williamson County. Old quarry. Tenth Census, 1880. 26789.

—— Light colored; fine and compact. Nolensville, Williamson County. Tenth Census, 1880. 26965.

—— Light colored; semi-crystalline. Columbia, Maury County. Tenth Census, 1880. 26968.

—— Light colored; fossiliferous. Two specimens. Carter's Creek Station, Maury County. Tenth Census, 1880. 26967.

—— Dark drab; semi-crystalline. Lebanon Pike, Wilson County. Mrs. Nichol's quarry. Tenth Census, 1880. 25784.

Limestone. Dark drab; compact. Murfreesborough, Rutherford County. Tenth Census, 1880. 26788.

—— Dull red; fossiliferous. Near Springfield, Henry County. Burns's quarry. Tenth Census, 1880. 25564.

—— Light colored; semi-crystalline; compact. Near Morristown, Hamblen County. M. Carriger's quarry. Tenth Census, 1880. 25994.

—— Light colored; finely fossiliferous. Breen's quarry. Tenth Census, 1880. 26786.

Granite. Coarse; gray. Southeast part of Carter County. Tenth Census, 1880. 26777.

Hornblende gneiss (?). Medium; gray. Hiwassee Copper Mines, Monroe County. Tenth Census, 1880. 26793.

Diorite (?). Very compact; nearly black; coarsely porphyritic; with scattering crystals of white feldspar. Carter County. Tenth Census, 1880. 26791.

Sandstone. Fine; dark blue-gray. Carter's Creek, Davidson County. Tenth Census, 1880. 26785.

—— Bright yellow; soft and porous. Twelfth district of Davidson County. J. Sullivant's quarry. Tenth Census, 1880. 27185.

—— Red; very ferruginous; soft and porous. Ducktown, Polk County. Tenth Census, 1880. 26966.

—— Fine; light drab. Church Mountain, Grainger County. Tenth Census, 1880. 26794.

—— Medium; light colored and pinkish. Two specimens. Sewanee, Franklin County. Tenth Census, 1880. 26796.

—— Coarse; light brown; cellular. Parksville, Polk County. Tenth Census, 1880. 26835.

—— Fine; light colored rust spotted. Parksville, Polk County. Tenth Census, 1880. 26836.

Conglomerate. Gray pink spotted; very hard and compact. Wolf Creek, Cocke County. Tenth Census, 1880. 26775.

—— Cambrian; greenish gray; fine; very hard and compact. Ocoee River, Polk County. Tenth Census, 1880. 26833.

—— Cambrian; gray; very hard and compact. Owen's Bluff on the Ocoee River, Polk County. Tenth Census, 1880. 26832.

Slate. Greenish. 4 by 4 by 3 inches. Near Ducktown, Polk County. Tenth Census, 1880. 26969.

TEXAS.

Limestone [marble]. Light yellow; compact; fossiliferous. Near Austin, Travis County. Quarry of C. W. Van Rosenbury. J. S. F. Batchen, 1884. 35576.

—— Cretaceous; drab; compact; coarsely fossiliferous. Austin, Travis County. J. McDonald's quarry. Tenth Census, 1880. 25716.

—— Lower Silurian; light drab, with purple veins; very fine and compact. Near Burnet, Burnet County. Holland's quarry. Tenth Census, 1880. 25720.

—— Lower Silurian; very light drab; fine and compact. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26692.

—— Blue-gray crystalline. Burnet, Burnet County. A. R. Johnson, 1887. 38819.

Dolomite [marble]. Dull red, with net-work of lighter lines. Burnet, Burnet County. A. R. Johnson, 1887. 38820.

Dolomite. Silurian; buff; fine and compact. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26272.

Dolomite. Silurian; fine; light colored. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26691.

—— Silurian; light buff; fine and compact. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26690.

—— Lower Silurian; nearly white; coarsely crystalline. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26693.

—— Silurian; pink; fine and compact. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 26271.

Ferruginous dolomite. Silurian; fine and compact; pinkish. Near San Saba, San Saba County. Dr. A. Gregg's quarry. Tenth Census, 1880. 25726.

Limestone. Light colored; fine; porous. Near Austin, Travis County. Tenth Census, 1880. 25723.

—— Light colored; fine; porous. Near Austin, Travis County. Tenth Census, 1880. 25560.

—— Cretaceous; light colored; fine; porous. Near Austin, Travis County. G. W. Brackinredge's quarry. Tenth Census, 1880. 25713.

—— Light colored; fine; porous. Round Rock, Williamson County. G. W. Davis's quarry. John S. F. Batchen, 1884. 35577.

—— Drab; compact. Near Burnet, Burnet County. Tenth Census, 1880. 25719.

Magnesian limestone. Cretaceous; light colored; fine; porous. Near Austin, Travis County. J. Sheehan's quarry. Tenth Census, 1880. 25714.

—— Cretaceous; light colored; fossiliferous. Two specimens. Near Austin, Travis County. J. Sheehan's quarry. Tenth Census, 1880. 25715.

Biotite granite. Fine; pink. Eight miles from Burnet, Burnet County. Tenth Census, 1880. 25722.

—— Coarse; red. Eight miles from Burnet, Burnet County. Tenth Census, 1880. 25721.

Diorite. Medium; light greenish gray. Near El Paso, El Paso County. J. S. F. Batchen, 1883. 28585.

Sandstone. Lower Silurian; coarse brown. Near Burnet, Burnet County. Tenth Census, 1880. 25717.

—— Lower Silurian; coarse; dull red. Near Burnet, Burnet County. Tenth Census, 1880. 25718.

—— Carboniferous; fine; very light gray. 4 by 3½ by 3 inches. Near Mormon Mills, Burnet County. Tenth Census, 1880. 25724.

UTAH.

Limestone [marble]. White; dark mottled; crystalline. Near Payson, Utah County. Tenth Census, 1880. 25398.

Dolomite [marble]. Black, with white fossils. Near Payson, Utah County. Tenth Census, 1880. 25452.

Limestone. Drab; fine and compact. Near Payson, Utah County. Tenth Census, 1880. 25453.

—— Light colored; porous. San Pete Valley. Tenth Census, 1880. 25352.

Hornblende biotite granite. Coarse; light gray. Two miles south of Salt Lake City. Tenth Census, 1880. 25351.

This stone was used in the construction of the new Mormon temple at Salt Lake City.

Sandstone. Fine; light pink. Near Red Butte, Salt Lake County. Tenth Census, 1880. 25399.

Sandstone. Fine; very light pink. Red Butte, 2½ miles east of Salt Lake City. Tenth Census, 1880. 25400.

VERMONT.

Steatite [soapstone]. Fine; compact; light blue-gray. Grafton. Centennial, 1876. 17569.

—— Coarse; compact; blue-gray. Townsend, Windham County. Bemis's quarry. Tenth Census, 1880. 26626.

Serpentine [ophiolite, verd-antique marble]. Green; white veined. Takes a high polish. Roxbury, Washington County. S. G. Emory, Washington, D. C., 1883. 27824.

—— Green; white veined. Takes a high polish. 5¾ by 4¾ by 1 inch. Roxbury, Washington County. S. G. Emory, Washington, D. C., 1883. 27825.

—— Dark green, with white veins. Takes a high polish. 11½ by 11½ by 5 inches. Roxbury, Washington County. Centennial, 1876. 17389.

Limestone [marble]. Turned column and urn, about 10 inches at base by 70 inches high, of white, dark-veined, crystalline limestone. Rutland, Rutland County. Centennial, 1876. 26013.

—— Turned column, about 10 inches at base by 50 inches high, of dark blue-gray crystalline limestone. Rutland, Rutland County. Centennial, 1876. 26014.

—— Turned vase, about 10 by 19 inches. Gray mottled crystalline limestone. Rutland, Rutland County. Centennial, 1876. 26016.

—— Turned column and urn, about 8 inches at base by 36 inches high, of blue-gray and white-mottled crystalline limestone. Rutland, Rutland County. Centennial, 1876. 26017.

—— Flooring tiles, set in a black walnut frame. Size, 3 feet square. The following marbles are represented, all from Vermont: Common white, Isle La Motte black, and red and white variegated from Swanton and Mallet's Bay. Centennial, 1876. 17447.

—— Flooring tiles, set in frame as above, comprising the following marbles: Vermont white; Isle La Motte black; Swanton and Mallet's Bay red and white variegated; Clinton, N. Y., gray; and Glen's Falls black. Centennial, 1876. 17448.

—— Lower Silurian. Dark blue-gray mottled. Three specimens. West Rutland, Rutland County. Esperanza Marble Company, 1884. 36833.

—— Lower Silurian. Dark blue-gray and white mottled; crystalline. About 16 by 38 by ½ inches. West Rutland. Esperanza Marble Company, 1884. 36848.

—— Lower Silurian. 10 by 10 by 6 inches. Blue-gray and white mottled; crystalline. West Rutland, Rutland County. Centennial, 1876. 17387.

—— Lower Silurian. White and dark mottled; crystalline. Three specimens. West Rutland, Rutland County. Columbian Marble Company. Tenth Census, 1880. 25710.

—— Lower Silurian. Blue-gray; crystalline. About 10 by 10 by 5¼ inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17385.

—— Lower Silurian. Gray and white mottled; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17386.

—— Lower Silurian. White; crystalline. 12-inch cube. West Rutland, Rutland County. Eureka Marble Company. Centennial, 1876. 17388.

—— Lower Silurian. Light blue; dark veined; crystalline. West Rutland, Rutland County. Rutland Marble Company. Tenth Census, 1880. 25730.

Limestone [marble]. Lower Silurian. Pure white; crystalline; statuary marble. West Rutland, Rutland County. Rutland Marble Company. Tenth Census, 1880. 25731.

—— Lower Silurian. White; dark spotted; crystalline. West Rutland, Rutland County. Rutland Marble Company. Tenth Census, 1880. 25732.

—— Lower Silurian. Blue-gray and white mottled; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17380.

—— Lower Silurian. Blue-gray and white mottled; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17381.

—— Lower Silurian. Blue-gray and white mottled; crystalline. About 8½ by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17382.

—— Lower Silurian. White; dark veined; crystalline. About 8½ by 8½ by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17384.

—— Lower Silurian. White; dark veined; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17384.

—— Lower Silurian. Blue-gray and white mottled; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17361.

—— Lower Silurian. White; crystalline. About 10 by 9¼ by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17362.

—— Lower Silurian. White; dark veined; crystalline. About 10 by 9 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17364.

—— Lower Silurian. Blue-gray mottled; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17365.

—— Lower Silurian. White; dark spotted; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17366.

—— Lower Silurian. Blue-gray; white mottled; crystalline. About 8½ by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17376.

—— Lower Silurian. White; dark veined; crystalline. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17377.

—— Lower Silurian. Gray and white mottled. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17378.

—— Lower Silurian. Blue-gray and white mottled; crystalline. About 8 by 8 by 4 inches. West Rutland, Rutland County. Centennial, 1876. 26015.

—— Lower Silurian; blue-gray and white, mottled; crystalline. About 12 by 12 by 8 inches. West Rutland, Rutland County. Centennial, 1876. 26027.

—— Lower Silurian; white crystalline. West Rutland, Rutland County. Quarry of Sherman & Slason. Tenth Census, 1880. 25802.

—— Lower Silurian; white, green-veined; crystalline. Two specimens. West Rutland, Rutland County. Quarry of Sherman & Slason. Tenth Census, 1880. 25803.

Limestone [marble]. Lower Silurian; pure white; crystalline. West Rutland, Rutland County. Quarry of Gibson & Woodfin. Tenth Census, 1880. 25734.

—— Lower Silurian; light blue; dark veined; crystalline. West Rutland, Rutland County. Quarry of Gibson & Woodfin. Tenth Census, 1880. 25735.

—— Lower Silurian; gray and white, mottled; crystalline. 12-inch cube. West Rutland, Rutland County. Centennial, 1876. 25217.

—— Lower Silurian; light blue, dark veined; crystalline. West Rutland, Rutland County. Quarry of Sheldon & Slason. Tenth Census, 1880. 25728.

—— Lower Silurian; white; crystalline. Marble slab, about 3 feet by 11 by 18 inches; used as a shelf. West Rutland, 1876. 17349.

—— Lower Silurian; white; crystalline. Marble slab, about 3 feet by 11 by 18 inches; used as a shelf. West Rutland, 1876. 17350.

—— Lower Silurian; white; crystalline. Marble slab, about 3 feet by 11 by 18 inches; used as a shelf. West Rutland, 1876. 17351.

—— Lower Silurian; white; crystalline. Marble slab, about 3 feet by 11 by 18 inches; used as a shelf. West Rutland, 1876. 17340.

—— Lower Silurian; white; green veined; crystalline. 12-inch cube. West Rutland, Rutland County. Centennial, 1876. 17458.

—— Lower Silurian; water blue; dark veined; crystalline. 12-inch cube. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17460.

—— Lower Silurian; white; green veined; crystalline. 12-inch cube. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17461.

—— Lower Silurian; white; crystalline. West Rutland, Rutland County. Centennial, 1876. 17390.

—— Lower Silurian; white; green veined; crystalline. West Rutland, Rutland County. Centennial, 1876. 17391.

—— Lower Silurian; pure white; crystalline. 12-inch cube. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17451.

—— Lower Silurian; pure white; crystalline. 12-inch cube. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17454.

—— Lower Silurian; white; crystalline. 12-inch cube. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17455.

—— Lower Silurian; white; green veined; crystalline. 12-inch cube. West Rutland, Rutland County. Centennial, 1876. 17456.

—— Lower Silurian; white; green veined; crystalline. 12-inch cube. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17459.

—— Lower Silurian; white; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17392.

—— Lower Silurian; white; green veined; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17393.

—— Lower Silurian; light blue; dark veined; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17395.

—— Lower Silurian; light blue; white spotted; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17396.

—— Lower Silurian; white; dark veined; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17397.

—— Lower Silurian; pure white; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17398.

—— Lower Silurian; pure white; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17400.

Limestone [marble]. Lower Silurian; white; dark spotted; crystalline. West Rutland, Rutland County. Centennial, 1876. 17394.

—— Lower Silurian; white; dark veined; crystalline. 10-inch cube. Centre Rutland, Rutland County. Eureka Marble Company. Centennial, 1876. 17356.

—— Lower Silurian; white; dark spotted; crystalline. 12-inch cube. Centre Rutland, Rutland County. Eureka Marble Company. Centennial, 1876. 17357.

—— White; crystalline. Slab about 2 feet 9 inches high, 2 feet wide, and 2 inches thick. Centre Rutland, Rutland County. Centennial, 1876. 17341.

—— White; crystalline. Slab about 2 feet 9 inches high, 2 feet wide, and 2 inches thick. Centre Rutland, Rutland County. Centennial, 1876. 17343.

—— White; crystalline. Slab about 2 feet 9 inches high, 2 feet wide, and 2 inches thick. Centre Rutland, Rutland County. Centennial, 1876. 17345.

—— Lower Silurian; white; dark veined; crystalline. 10-inch cube. Centre Rutland, Rutland County. Centennial, 1876. 17355.

—— Crystalline; white; green veined. Slab about 2 feet 9 inches by 2 feet wide by 2 inches thick. Centre Rutland. Centennial, 1876. 17338.

—— Lower Silurian; pure white; crystalline. Two specimens. Pittsford, Rutland County. Pittsford Marble Company. Tenth Census, 1880. 25690.

—— Lower Silurian; white; dark veined; crystalline. 12-inch cube. Pittsford, Rutland County. Burlington Manufacturing Company. Centennial, 1876. 17468.

—— Lower Silurian; water-blue; crystalline. 12-inch cube. North Pittsford, Rutland County. Burlington Manufacturing Company. Centennial, 1876. 17464.

—— Lower Silurian; white; dark veined; crystalline. 12-inch cube. North Pittsford, Rutland County. Burlington Manufacturing Company. Centennial, 1876. 17466.

—— Lower Silurian; white; dark veined; crystalline. About 12 by 12 by 12 inches. North Pittsford, Rutland County. Burlington Manufacturing Company. Centennial, 1876. 17467.

—— Lower Silurian; pure white; fine crystalline. South Wallingford, Rutland County. William W. Kelley's quarry. Tenth Census, 1880. 26300.

—— Lower Silurian; 10 by 10 by 6 inches; white, dark veined; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17358.

—— Lower Silurian, white, dark spotted; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17509.

—— Lower Silurian; white, dark veined; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17500.

—— Lower Silurian; white, dark spotted; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17501.

—— Lower Silurian; white, dark spotted; crystalline. About 10 by 10 by 8 inches. Sutherland Falls, Rutland Company; Sutherland Falls Marble Company. Centennial, 1876. 17369.

—— Lower Silurian; white, dark spotted; crystalline. 12-inch cube. Sutherland Falls, Rutland County. Centennial, 1876. 17370.

—— Lower Silurian; white, dark veined; crystalline. About 8½ by 6 inches. Sutherland Falls, Rutland County. Centennial, 1876. 17371.

—— Lower Silurian; white, dark spotted; crystalline. 12-inch cube. Sutherland Falls, Rutland County. Centennial, 1876. 17373.

Limestone [marble]. Lower Silurian; white; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17502.

—— Lower Silurian; white, dark mottled; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17503.

—— Lower Silurian; white, dark veined; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17506.

—— Lower Silurian; blue and white mottled; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17507.

—— Lower Silurian; white, dark veined; crystalline. Sutherland Falls, Rutland County. Centennial, 1876. 17508.

—— Lower Silurian; white, dark veined; crystalline. 12-inch cube. Sutherland Falls, Rutland County; Sutherland Falls Marble Company. Centennial, 1876. 17374.

—— Lower Silurian; white, dark spotted; crystalline. 12-inch cube. Southerland Falls, Rutland County. Centennial, 1876. 17359.

—— Lower Silurian; dark gray; fossiliferous. Isle La Motte, Grand Isle County. Quarry of Fiske and Barney. Tenth Census, 1880. 26926.

—— Lower Silurian; white; crystalline. Dorset, Bennington County. Quarry of Freedly & Son. Tenth Census, 1880. 26273.

—— Lower Silurian; white; crystalline. Dorset, Bennington County. S. F. Prince's quarry. Tenth Census, 1880. 26274.

—— Lower Silurian; white; crystalline. Dorset, Bennington County. Quarry of S. F. Prince & Co. Tenth Census, 1880. 26733.

—— Lower Silurian; white, dark spotted; crystalline. 12-inch cube. East Dorset, Bennington County. Centennial, 1876. 25087.

—— Lower Silurian; white, dark spotted; crystalline. 10-inch cube. East Dorset, Bennington County. Centennial, 1876. 17462.

—— Lower Silurian; white, dark veined; crystalline. Rutland, Rutland County. Quarry of Flint Bros. & Co. Tenth Census, 1880. 25805.

—— Lower Silurian; white, dark veined; crystalline. Two specimens. Rutland, Rutland County. Quarry of Flint Bros. & Co. Tenth Census, 1880. 25736.

—— Lower Silurian; pure white; crystalline; statuary marble. West Rutland, Rutland County. Quarry of Sheldon & Slason. Tenth Census, 1880. 25729.

—— Lower Silurian; white; crystalline. Pittsford, Rutland County. Quarry of F. W. Smith & Co. Tenth Census, 1880. 26674.

—— Lower Silurian; light blue and white; crystalline. Pittsford, Rutland County. Quarry of F. W. Smith & Co. Tenth Census, 1880. 26675.

—— Lower Silurian; white, dark spotted; crystalline. Pittsford, Rutland County. Quarry of F. W. Smith & Co. Tenth Census, 1880. 26676.

—— Lower Silurian; white, dark veined; crystalline. Pittsford, Rutland County. George E. Hall's quarry. Tenth Census, 1880. 25692.

—— Lower Silurian; white, dark spotted; crystalline. South Wallingford, Rutland County. William W. Kelley's quarry. Tenth Census, 1880. 26677.

—— Lower Silurian; light blue, and white mottled; crystalline. Two specimens. South Wallingford, Rutland County. William W. Kelley's quarry. Tenth Census, 1880. 26678.

—— Lower Silurian; pure white; crystalline; statuary marble. Brandon, Rutland County. Brandon Statuary Marble Company. Tenth Census, 1880. 25689.

—— Lower Silurian; white, dark veined; crystalline. East Dorset, Bennington County. Quarry of D. L. Kent & Company. Tenth Census, 1880. 26275.

Limestone [marble]. Lower Silurian; white, dark veined; crystalline. New Haven, Addison County. Cutter Marble Company. Tenth Census, 1880. 27034.

—— Lower Silurian; French gray; very fine and compact. Swanton, Franklin County. Quarry of George and R. L. Barney. Tenth Census, 1880. 26928.

—— Lower Silurian; gray and white mottled. About 10 by 10 by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17379.

—— Lower Silurian; white, dark veined; crystalline. About 8½ by 6 inches. West Rutland, Rutland County. Columbian Marble Company. Centennial, 1876. 17360.

—— Lower Silurian; water-blue; dark veined; crystalline. 12-inch cube. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17459.

—— Lower Silurian; white green veined; crystalline. West Rutland, Rutland County. Rutland Marble Company. Centennial, 1876. 17399.

—— Lower Silurian; white dark veined; crystalline. About 10 by 10 by 7½ inches. Sutherland Falls, Rutland County. Centennial, 1876. 17367.

Magnesian limestone. Lower Silurian; dark gray, nearly black; fossiliferous. Isle La Motte, Grand Isle County. Quarry of Goodsell & Hursh. Tenth Census, 1880. 26185.

—— Lower Silurian; gray; fine grained; fossiliferous. Isle La Motte, Grand Isle County. Tenth Census, 1880. 26186.

—— Lower Silurian; dark gray; compact; fossiliferous. Isle La Motte, Grand Isle County. Quarry of Ira & J. P. Hall. Tenth Census, 1880. 26188.

—— Lower Silurian; blue-black; compact. Isle La Motte, Grand Isle County. Quarry of Ira & J. P. Hall. Tenth Census, 1880. 26189.

—— Lower Silurian; dark gray; compact; fossiliferous. Isle La Motte, Grand Isle County. Quarry of H. C. Fisk & Son. Tenth Census, 1880. 26190.

—— Lower Silurian; blue-black; compact. Isle La Motte, Grand Isle County. Quarry of H. C. Fisk & Son. Tenth Census, 1880. 26191.

—— Lower Silurian; dark gray; fine and compact. Isle La Motte, Grand Isle County. Burlington Manufacturing Company. Tenth Census, 1880. 26673.

—— Lower Silurian; dark gray; fossiliferous. Isle La Motte, Grand Isle County. Quarry of Fiske & Barney. Centennial, 1876. 17420.

—— Lower Silurian; black; compact; fossiliferous. Isle La Motte, Grand Isle County. Quarry of Fiske & Barney. Centennial, 1876. 17421.

—— Lower Silurian; nearly black; fossiliferous. 12-inch cube. Isle La Motte, Grand Isle County. Quarry of Fiske & Barney. Centennial, 1876. 17422.

Dolomite [marble]. Cambrian; pink and gray mottled; fine; compact. Mallet's Bay, Chittenden County. Centennial, 1876. 17495.

—— Cambrian; light red mottled; fine and compact. About 5½ by 5½ by 2½ inches. Mallet's Bay, Chittenden County. Centennial, 1876. 17496.

—— Cambrian; pink mottled. About 7 by 7½ by 7½ inches. Mallet's Bay, Chittenden, County. Centennial, 1876. 17497.

—— Cambrian; red mottled. 6-inch cube. Mallet's Bay, Chittenden County Centennial, 1876. 17489.

—— Cambrian; dark pink; fine and compact. About 4 by 4 by 2½ inches. Mallet's Bay, Chittenden County. Centennial, 1876. 17490.

—— Cambrian; pink mottled; fine and compact. Mallet's Bay, Chittenden County. Centennial, 1876. Two specimens. 17493.

Dolomite [marble]. Cambrian; red mottled; fine and compact. About 4½ by 4 by 2 inches. Mallet's Bay, Chittenden County. Centennial, 1876. 17492.

—— Cambrian; red mottled; fine; compact. About 9¼ by 7½ by 2 inches. Mallet's Bay, Chittenden County. Centennial, 1876. 17494.

—— Cambrian; red mottled; fine and compact. Mallet's Bay, Chittenden County. Centennial, 1876. 25200.

—— Cambrian; red and white mottled; fine and compact. Swanton, Franklin County. Quarry of George and R. L. Barney. Tenth Census, 1880. 26929.

—— Cambrian; red and white mottled; 12-inch cube. Swanton, Franklin County. Centennial, 1876. 17416.

—— Lower Silurian; red and white mottled; fine and compact. Swanton, Franklin County. George Barney's quarry. Centennial, 1876. 17419.

—— Cambrian; red and white mottled; fine and compact. Swanton, Franklin County. Quarry of George and R. L. Barney. Tenth Census, 1880. 26927.

Biotite granite. Medium; gray. Near Woodbury, Washington County. Quarry of J. Ainsworth & Son. Tenth Census, 1880. 25581.

—— Medium; dark gray. Near Woodbury, Washington County. C. W. Cilley's quarry. Tenth Census, 1880. 25582.

—— Medium; dark gray. Near Woodbury, Washington County. C. W. Cilley's quarry. Tenth Census, 1880. 26647.

—— Medium; gray. Barre, Washington County. Quarry of Wetmore & Morse. Tenth Census, 1880. 25584.

—— Medium; gray. Barre, Washington County. E. L. Smith's quarry. Tenth Census, 1880. 25585.

—— Medium; gray. Barre, Washington County. G. W. Mann's quarry. Tenth Census, 1880. 25586.

—— Fine; gray. Foot cube. Barre, Washington County. Centennial, 1876. 17478.

—— Fine; dark gray. Brunswick, Essex County. Saint Johnsbury Granite Company. Tenth Census, 1880. 26184.

Muscovite granite. Fine; very light gray, nearly white. Bethel, Windsor County. E. Kittredge's quarry. Tenth Census, 1880. 25566.

—— Fine; very light gray, nearly white. Bethel, Windsor County. Quarry of E. Sturtevant & Co. Tenth Census, 1880. 25567.

—— Fine; very light gray, nearly white. Foot cube. Bethel, Windsor County. Centennial, 1876. 17469.

Biotite muscovite granite. Medium; light gray. Ryegate, Caledonia County. R. W. Laird's quarry. Tenth Census, 1880. 26183.

—— Coarse; gray. Ryegate, Caledonia County. R. F. Carter's quarry. Tenth Census, 1880. 26487.

Slate. Cambrian; blue-black. Two specimens. Northfield, Washington County. Adams Slate and Tile Company. Tenth Census, 1880. 25587.

—— Cambrian; brownish gray. 4 by 4 by 1 inches. Castleton, Rutland County. Eagle Slate Company. Tenth Census, 1880. 25807.

—— Cambrian; green and purple. 4 by 4 by 1 inches. Castleton, Rutland County, Eagle Slate Company. Tenth Census, 1880. 25808.

—— Cambrian; greenish. 4 by 4 by 1 inches. Castleton, Rutland County. Eagle Slate Company. Tenth Census, 1880. 25809.

—— Cambrian; greenish. 4 by 4 by 1½ inches. Castleton, Rutland County. Blue Slate Company. Tenth Census, 1880. 25810.

Slate. Cambrian; greenish. 4 by 4 by 3 inches. Fair Haven, Rutland County. Quarry of P. Roberts. Tenth Census, 1880. 25811.

—— Cambrian; purple. 4 by 4 by 1½ inches. Two specimens. Castleton, Rutland County. Quarry of Clifford & Litchfield. Tenth Census, 1880. 25813.

—— Cambrian; purple. Castleton, Rutland County. Quarry of R. Conway. Tenth Census, 1880. 25814.

—— Cambrian; purple. 4 by 4 by ½ inches. Castleton, Rutland County. Snowden Slate Company. Tenth Census, 1880. 25815.

—— Cambrian; blue-black. Castleton, Rutland County. Lake Shore Company. Tenth Census, 1880. 25816.

—— Cambrian; greenish. Poultney, Rutland County. Evergreen Slate Company. Tenth Census, 1880. 25817.

—— Cambrian; reddish. Fair Haven, Rutland County. Quarry of Griffiths Owen & Co. Tenth Census, 1880. 25818.

—— Cambrian; red. 4 by 4 by 1½ inches. Rutland, Rutland County. Quarry of L. Owens & Co. Tenth Census, 1880. 25953.

—— Cambrian; green. 4 by 4 by 1½ inches. Poultney, Rutland County. Quarry of L. Owens & Co. Tenth Census, 1880. 25954.

—— Cambrian; blue-black. 4 by 4 by 2 inches. Two specimens. Poultney, Rutland County. Globe Slate Company. Tenth Census, 1880. 25955.

—— Cambrian; greenish. 4 by 4 by 2 inches. Two specimens. Poultney, Rutland County. Quarry of J. Evans & Co. Tenth Census, 1880. 25956.

—— Cambrian; green. 4 by 4 by 2 inches. Poultney, Rutland County. Macgrath's quarry. Tenth Census, 1880. 25970.

—— Cambrian; green. 4 by 4 by 1½ inches. Poultney, Rutland County. Quarry of D. Culver. Tenth Census, 1880. 25971.

—— Cambrian; greenish. 4 by 4 by ½ inches. Pawlet, Rutland County. M. Welch's quarry. Tenth Census, 1880. 26039.

—— Cambrian; green. 4 by 4 by 2½ inches. Pawlet, Rutland County. Quarry of W. J. Evans. Tenth Census, 1880. 26040.

—— Cambrian; green. 4 by 4 by 1 inches. Pawlet, Rutland County. J. S. Warren's quarry. Tenth Census, 1880. 26041.

—— Cambrian; greenish. 4 by 4 by 2 inches. Pawlet, Rutland County. Quarry of H. J. Williams. Tenth Census, 1880. 26042.

—— Cambrian; purple. 4 by 4 by 1½ inches. Pawlet, Rutland County. E. R. Norton's quarry. Tenth Census, 1880. 26043.

—— Cambrian; green. West Pawlet, Rutland County. Brownell Slate and Flagging Company. Tenth Census, 1880. 26044.

—— Cambrian; green. 4 by 4 by 1 inches. West Pawlet, Rutland County. Quarry of H. W. Hughes. Tenth Census, 1880. 26045.

—— Cambrian; green. 4 by 4 by 2½ inches. West Pawlet, Rutland County. Quarry of Rising & Nelson. Tenth Census, 1880. 26046.

—— Cambrian; greenish. 4 by 4 by 2½ inches. West Pawlet, Rutland County. Quarry of O. Evans & Son. Tenth Census, 1880. 26047.

—— Cambrian; greenish. 4 by 4 by 1, and 4 by 4 by 2 inches. Two specimens. West Pawlet, Rutland County. H. Dillingham's quarry. Tenth Census, 1880. 26048.

—— Cambrian; blue-black. Slab 8 inches square. Dummerston, Windham County. Tenth Census, 1880. 26160.

—— Cambrian; blue-black. 4 by 4 by 2 inches. 8 miles from Brattleborough, Windham County. T. Johnson's quarry. Tenth Census, 1880. 26161.

Slate. Cambrian; green. 4 by 4 by 1½ inches. Two specimens. Poultney, Rutland County. Eureka quarry. Tenth Census, 1880. 27183.

VIRGINIA.

Steatite [soapstone]. Medium; compact; blue-gray. Near Langley, Fairfax County. Tenth Census, 1880. 25254.

—— Very light colored, schistose. Near Falls Church, Fairfax County. E. L. Howard, 1883. 28649.

Gypsum. Coarse; gray; white mottled. Saltville, Smyth County Holston Salt and Plaster Company. Centennial, 1876. 27129.

—— White; dark veined. Saltville, Smyth County. Quarries of Stuart & Palmer. Centennial, 1876. 27153.

Limestone [stalagmitic marble]. About 13 by 8 inches. Luray, Page County. From Luray Cave. Gift of Henry Horan, 1855. 37613.

—— About 14½ by 10½ by 7½ inches. Luray, Page County. From Luray Cave. Robert Corson, 1881. 25637.

—— About 4½ by 3½ by 3¼ inches. Luray, Page County. From Luray Cave. Robert Corson, 1881. 25374.

Limestone [stalagmite marble]. Light brown. 4½ by 2 by 1 inches. Rockbridge County. U. S. General Land Office, 1882. 27268.

—— A polished slab 14 by 15 by ½ inches, mounted in a black frame. Taken from a small cave that had become completely filled up by the stalagmitic deposit. Locality, about 20 miles northwest from Lexington, Rockbridge County. Dr. George W. Hawes. 26434.

Limestone [marble]. Cross-section of a stalagmite. Oval in shape; about 8½ by 6 by 2 inches. Luray Cave, Page County. Robert R. Corson, 1881. 27056.

—— Pink, crystalline. Near Aldie, Loudoun County. Miss Carter's quarry. E. Howard, 1883. 36788.

—— Upper Silurian. Gray with pink spots; fossiliferous. Craigsville, Augusta County. Coral Marble Company. Tenth Census, 1880. 25481.

—— Upper Silurian. Reddish; fossiliferous; semi-crystalline. Craigsville, Augusta County. Craig's quarry. Tenth Census. 25598.

Dolomite [marble]. Red; finely crystalline. Madison Run Station, Orange County. H. T. & W. G. Douglass, 1882. 26989.

Calcareous Dolomite [marble]. Pale; pink; crystalline. Loudoun County. Loudoun County Marble Quarry. Tenth Census, 1880. 27073.

Marble. Red and green mottled. 6 by 4 by 1 inches. Ashby's Gap, Cumberland County. A. S. Payne's quarry. Centennial, 1876. 27198.

Magnesian Limestone [marble]. Upper Silurian. Gray, with pink spots; fossiliferous. Craigsville, Augusta County. Coral Marble Company. Tenth Census, 1880. 25482.

—— Gray, and dark-blue gray, nearly black. Two specimens. Near Natural Bridge, Rockbridge County. J. G. Steele's quarry. Tenth Census, 1880. 26752.

Biotite granite. Medium; gray and greenish gray. Two specimens. Namozin district, Dinwiddie County. D. W. Lassiter's quarry. Tenth Census, 1880. 25278.

—— Medium; greenish gray. Namozin district, Dinwiddie County. Mayfield quarry. Tenth Census, 1880. 25279.

—— Medium; gray. Granite, Chesterfield County. Old Dominion Granite Company. Tenth Census, 1880. 25272.

Biotite granite. Medium; gray. Two specimens. Manchester, Chesterfield County. Westham Granite Company. Tenth Census, 1880. 25271.

—— Fine; gray. Tuckahoe district, Henrico County. Quarry of J. B. Mitchel & Co. Tenth Census, 1880. 25269.

—— Medium; gray. Near Richmond, Henrico County. Richmond Granite Company. Tenth Census, 1880. 25270.

Muscovite granite. Medium; light gray. Near Fredericksburgh, Spottsylvania County. E. J. Leyburn's quarry. Tenth Census, 1880. 25263.

Biotite gneiss. Fine; dark gray; two specimens. Lynchburgh, Campbell County. Fishing Creek Quarry. Tenth Census, 1880. 25280.

Biotite schist. Fine; dark gray. Near Chain Bridge, Fauquier County. Gilbert's quarry. Tenth Census, 1880. 25289.

Amphibolite. Compact; dark green. Lynchburgh, Campbell County. R. Evans, 1884. 35908.

Diabase. Mesozoic. Medium; dark gray. Used only for street pavements; three miles from Leesburgh, Loudoun County. T. W. Edwards' quarry Tenth Census, 1880. 25963.

—— Mesozoic. Fine; dark gray. Near Catletts Station, Fauquier County. Used only for street pavements. Fauquier quarry. Tenth Census, 1880. 25341.

Sandstone. Juro-Cretaceous. Light colored, soft and friable. Acquia Creek, Stafford County. Colonel Edward Clark, 1881. 25007.

—— Fine; very light brown. Saltville, Washington County. Centennial, 1876. 27131.

—— Triassic. Light reddish-brown; fine. Manassas, Prince William County. Mayfield Brownstone Company. Tenth Census, 1880. 27243.

Slate. Blue-black. Slab 8 inches square. New Canton, Buckingham County. Quarry of Edwards & Roberts. Tenth Census, 1880. 25275.

—— Blue-black. Slab 8 inches square. New Canton, Buckingham County. Quarry of J. R. Williams & Co. Tenth Census, 1880. 25277.

WEST VIRGINIA.

Limestone [marble]. Light gray; coarse. Near Snyder's Mills, Jefferson County. Tenth Census, 1880. 26100.

Magnesian limestone [marble]. Coarsely variegated, crystalline. Near Dam No. 4, Jefferson and Berkeley Counties. Snyder's Mills quarry. Tenth Census, 1880. 26101.

Sandstone. Medium; light colored. Wheeling, Ohio County. Quarry of Schule & Lotz. Tenth Census, 1880. 25659.

—— Coarse; buff. Near Grafton, Taylor County. Grafton quarries. Tenth Census, 1880. 26849.

—— Fine; dark gray. Rowlesburgh, Preston County. Quarry of Sullivan & Peat. Tenth Census, 1880. 26850.

—— Carboniferous; medium; light colored. Near Charleston, Kanawha County. Connor's quarry. Tenth Census, 1880. 26949.

—— Carboniferous, medium; light gray. Near Charleston, Kanawha County. J. T. Quarrier's quarry. Tenth Census, 1880. 26950.

—— Carboniferous; medium; light colored. Near Charleston, Kanawha County. "Coon-Skin" quarry. Tenth Census, 1880. 26952.

—— Medium; light colored. Parkersburgh, Wood County. "Pole-Cat" quarry. Tenth Census, 1880. 26963.

Sandstone. Dull red; fine and compact. Berkeley Springs, Morgan County. Philip Pendleton. 36829.

WASHINGTON TERRITORY.

Sandstone. Carboniferous; fine; gray. Bellingham Bay, Whatcom County. Quarry of C. Seidel & Co. Tenth Census, 1880. 26248.

—— Carboniferous; fine; gray. Chukannt Bay, Whatcom County. Quarry of C. Seidel & Co. Tenth Census, 1880. 26961.

WISCONSIN.

Dolomite. Upper Silurian. Light drab; cellular. Near Racine, Racine County. Quarry of C. Fox & Sons. Tenth Census, 1880. 27155.

—— Upper Silurian. Light drab; fine and compact. Waukesha, Waukesha County. Quarry of Hadfield & Co. Tenth Census, 1880. 27066.

—— Upper Silurian. Light colored; fine and compact. Waukesha, Waukesha County. Quarry of Hadfield & Co. Tenth Census, 1880. 27067.

—— Upper Silurian. Light colored; very fine and compact; two specimens. Milwaukee, Milwaukee County. Story Brothers quarry. Tenth Census, 1880. 27083.

—— Upper Silurian. Coarse and fine; light drab; two specimens. Milwaukee, Milwaukee County. Milwaukee Stone Company. Tenth Census, 1880. 27112.

—— Lower Silurian. Fine; porous; very light buff. Near La Crosse, La Crosse County. J. Neilson's quarry. Tenth Census, 1880. 26463.

—— Lower Silurian. Fine; porous; very light buff. Near La Crosse, La Crosse County. M. Neilson's quarry. Tenth Census, 1880. 26464.

—— Upper Silurian. Light drab; very fine and compact. Near Fond du Lac, Fond du Lac County. C. Geiger's quarry. Tenth Census, 1880. 25864.

—— Upper Silurian; drab; cellular, Waupun, Fond du Lac County. Waupun quarry. Tenth Census, 1880. 27176.

—— Upper Silurian; light colored; very fine and porous. Taycheedah Township, Fond du Lac County. Quarry of Berry & Bannister. Tenth Census, 1880. 25883.

—— Upper Silurian; light drab; very fine and compact; will take a good polish; 2 specimens. Byron, Fond du Lac County. S. Sylvester's quarry. Tenth Census, 1880. 25881.

—— Upper Silurian; light colored and drab; very fine and compact; 2 specimens. Byron, Fond du Lac County. Quarry of S. Sylvester, jr. Tenth Census, 1880. 25882.

—— Upper Silurian; very light drab; fine and compact. Near Eden Station, Fond du Lac County. Marblehead Lime Company. Tenth Census, 1880. 25884.

—— Upper Silurian; light drab; very fine and compact. Takes a good polish. Near Eden, Fond du Lac County. Quarry of Nast Bros. & Co. Tenth Census, 1880. 25885.

—— Upper Silurian; very fine and compact; light colored. Eden, Fond du Lac County. Cardiff quarry. J. S. F. Batchen, 1883. 27517.

—— Upper Silurian; drab; very fine and compact. Near Sheboygan, Sheboygan County. Quarry of H. E. Roth. Tenth Census, 1880. 26940.

—— Upper Silurian; drab; very fine and compact. Sheboygan Falls, Sheboygan County. Tenth Census, 1880. 26941.

—— Upper Silurian; drab; very fine and compact. Near Manitowoc, Manitowoc County. Quarry of Lewis Miller & Co. Tenth Census, 1880. 26933.

Dolomite. Lower Silurian; coarse; dark drab. Near Oshkosh, Winnebago County. F. Last's quarry. Tenth Census, 1880. 25886.

—— Lower Silurian. Coarse; dark drab. Near Oshkosh, Winnebago County. Quarry of Schneider & Frank. Tenth Census, 1880. 25887.

—— Lower Silurian; dark drab. Near Menasha, Winnebago County. R. Scott's quarry. Tenth Census, 1880. 25942.

—— Lower Silurian; dark drab. Neenah, Winnebago County. P. McGrath's quarry. Tenth Census, 1880. 25943.

—— Lower Silurian; light colored and dark mottled; 2 specimens. River Falls, Pierce County. T. Walker's quarry. Tenth Census, 1880. 27174.

—— Lower Silurian; fine; very light buff. Near Winona mine, Buffalo County. Quarry of H. J. Willis. Tenth Census, 1880. 26641.

—— Lower Silurian; coarse; buff mottled. Near Winona mine, Buffalo County. Quarry of H. J. Willis. Tenth Census, 1880. 26642.

—— Lower Silurian; drab. Near Kaukauna, Outagamie County. United States Government quarry. Tenth Census, 1880. 25940.

—— Lower Silurian; drab. Ledyard, Outagamie County. Kaukauna Water Power Company. Tenth Census, 1880. 25941.

—— Lower Silurian; dark drab. Near Duck Creek Station, Brown County. Chicago and Northwestern Railway Company. Tenth Census, 1880. 25957.

—— Light drab; cellular. Hayton, Calumet County. Cardiff quarry. J. S. F. Batchen, 1883. 27509.

—— Light drab; fine and porous. Prairie du Chien, Crawford County. Marsden's quarry. Tenth Census, 1880. 27054.

Biotite gneiss. Fine; red. Village of Black River Falls, Jackson County. Tenth Census, 1880. 26702.

Granite. Medium; reddish brown. Montello, Marquette County. Montello Granite Company. Tenth Census, 1880. 26915.

—— Wausau, Marathon County. J. Kolter's quarry. Tenth Census, 1880. 26921.

Hornblende granite. Medium; dark brownish. Wausau, Marathon County. Big Bull Falls quarry. Tenth Census, 1880. 26922.

Quartz Porphyry. Dark, nearly black. Marquette, Green Lake County. Wampum Granite Company. Tenth Census, 1880. 27177.

—— Dark, nearly black. Near Brandon, Fond du Lac County. J. Densmore's quarry J. S. F. Batchen, 1883. 28503.

Sandstone. Lower Silurian; light colored; fine and compact. Near Ableman, Sauk County. Tenth Census, 1880. 26703.

—— Lower Silurian; light colored; fine and compact. Ableman, Sauk County. W. Lee's quarry. Tenth Census, 1880. 26704.

—— Lower Silurian; light red and very light colored; fine and friable. Two specimens. Mauston, Juneau County. H. V. Train's quarry. Tenth Census, 1880. 26917.

—— Lower Silurian; fine; light colored. Near Mauston, Juneau County. C. W. Potter's quarry. Tenth Census, 1880. 26939.

—— Very light colored. Near Packwaukee, Marquette County. T. B. Hawes's quarry. Tenth Census, 1880. 26919.

—— Nearly quartzite. Lower Silurian; light colored. Stevens' Point, Portage County. J. N. Avery's quarry. Tenth Census, 1880. 26920.

—— Nearly quartzite. Lower Silurian; light colored; compact. Grand Rapids, Wood County. Quarry of J. Edwards & Co. Tenth Census, 1880. 26918.

Sandstone. Lower Silurian; fine; very light buff. Near Madison, Dane County. A. Kinnear's quarry. Tenth Census, 1880. 27077.

Quartzite. Lower Silurian; gray; very hard and compact. Near Waterloo, Jefferson County. Wisconsin and Chicago Quarrying Company. Tenth Census, 1880. 27154.

—— Lower Silurian; gray; very hard and compact. Near Waterloo, Jefferson County. Chicago and Wisconsin Quarrying Company. J. S. F. Batchen, 1882. 27193.

WYOMING.

Granite. Medium; pink. Sherman, Albany County. Tenth Census, 1880. 26984.

—— Fine; light reddish. Sherman, Albany County. Tenth Census, 1880. 26986.

Hornblende granite. Very coarse; red. Dale Creek. G. Griffith's quarry. Tenth Census, 1880. 25558.

METHODS OF CUTTING AND POLISHING.

The three independent series enumerated below are designed to show the kind of finish commonly applied to the different varieties of stone. The illustrations on Plate IV were drawn from these, and the descriptions given on page 319 explain the methods by which each finish is produced and for what kind of work each is particularly adapted.

(1) The first of these is a series of nineteen blocks, white and colored marbles, in sizes about 12 inches square by 2 inches thick, from quarries at West Rutland, Vt. Gift of the Vermont Marble Company, 1882. They are finished as follows: Rock face, 26878; rough-pointed surface, 26877 and 27334; fine-pointed surface, 26876 and 27340; tooth-chiseled surface, 26875 and 27332; bush-hammered surface, 26874; square-droved surface, 26873 and 27335; sanded surface, 27337; fine-sanded surface, 26871 and 27333; pumiced surface, 26872; honed surface, 27336; acid-gloss surface (polished), 26870 and 27338; putty-gloss surface (polished), 26879 and 27339.

(2) The second is a series of eight blocks of Quincy (Mass.) granite, in sizes as above, the gift of Henry Barker & Son, Quincy, Mass. Rock face, 27120; pointed surface, 27118; ax-hammered surface, 27117; sawed surface, 27119; six-cut surface, 27116; eight-cut surface, 27115; ten-cut surface, 27114; polished surface, 27117.

(3) The third is a series of eight blocks of light-colored Ohio sandstone, in sizes about 12 inches square by 3 inches thick. Gift of the McDermott & Berea Stone Company, of Cleveland, Ohio. Rough-pointed surface, 26993; pointed surface, 26995, 26992, and 26990; fine-pointed surface, 26994; sanded surface, 26997; tooth-chiseled surface, 26991; droved surface, 26996.

II. FOREIGN.

(1) BRITISH PROVINCES OF NORTH AMERICA—CANADA.

Limestone. Dark gray; crystalline. Montreal, Province of Quebec. J. S. F. Batchen, 1883. 28643.

—— Dark gray; semi-crystalline; fossiliferous. Near Montreal, Province of Quebec. J. S. F. Batchen, 1883. 28644.

—— Dark; semi-crystalline; fossiliferous. Kingston, Province of Ontario. J. S. F. Batchen, 1883. 28645.

Slate. Blue-black. Montreal, Province of Quebec. New Rockland Slate Company. Centennial, 1876. 25241.

Sandstone. Lower Silurian; fine; reddish. Nepigon Bay, Lake Superior, Province of Ontario. Verte Island quarry. J. S. F. Batchen, 1883. 27362.

Sandstone. Lower Silurian; fine; reddish. 18-inch cube. North shore of Lake Superior, Province of Ontario. Verte Island Quarry. John S. F. Batchen, 1883. 27526.

—— Fine; light colored. Georgetown, Province of Ontario. John S. F. Batchen, 1883. 28646.

—— Fine; light brown. Near Brampton, Credit River Valley. Quarry of K. Chisholm, M. P. John S. F. Batchen, 1884. 34993.

—— Medium; brown. Pyramidal block, about 9 inches high and 4 inches square at base. Harvey, Albert & Co., Province of New Brunswick. Mary's Point Quarry. Tenth Census, 1880. 27006.

—— Medium; brown. Pyramidal block, about 8 inches high and 4 inches square at base. Sackville, Westmoreland County, Province of New Brunswick. Wood Point Quarry. Tenth Census, 1880. 27007.

—— Sub-Carboniferous; fine; gray. Dorchester, Province of New Brunswick. J. S. F. Batchen, 1883. 27524.

—— Sub-Carboniferous; fine; gray. Dressed block, 30 inches high, cut in shape of Liberty Bell. Dorchester, Province of New Brunswick. Centennial, 1876. 25070.

—— Sub-Carboniferous; fine; gray. Large block, 22 inches wide, 3 feet 9 inches high, surmounted by Liberty Bell. Dorchester, Province of New Brunswick. Centennial, 1876. 25071.

—— Sub-Carboniferous; fine; olive. Dorchester, Westmoreland County, Province of New Brunswick, Canada. Tenth Census, 1880. 26665.

—— Sub-Carboniferous; fine; brown. Mary's Point, Province of New Brunswick. Tenth Census, 1880. 26669.

—— Fine; light brown and gray. 6 by 4 by 1½ inches. Two specimens. Clifton, Province of New Brunswick. New Orleans Exposition, 1885. 37669.

Biotite granite. Coarse gray. 13 by 12 by 10 inches. Purcell Cove quarries, northwest arm of Halifax County, Province of Nova Scotia. American Society Mining Engineers, 1886. 37852.

—— Medium; gray. 12-inch cube. Shelburne, Province of Nova Scotia. Shelburne Quarry Company. American Society Mining Engineers, 1886. 37851.

—— Coarse; pinkish gray. Broken column, 4½ by 4 inches and 4½ by 3 inches. Two specimens. St. George, Province of New Brunswick. 37666.

Hornblende granite. Polished urn of dark red granite. St. George, Province of New Brunswick. 35729.

—— Coarse; bright red. St. George, Province of New Brunswick. 37626.

(2) BERMUDA.

Coralline limestone. Nearly white; coarsely cellular. 10 by 4 by 3¼ inches. Centennial, 1876. 26009.

(3) MEXICÓ.

Gypsum. White; dark veined. Slab, 6 inches square. Mexican Geographical Exploring Commission, 1885. 37761.

—— White; fibrous. Slab, 6 inches square. State of Sonora. Mexican Geographical Exploring Commission, 1885. 37763.

Marble. Compact; yellowish. Vera Cruz. Mexican Geographical Exploring Commission, 1885. 37762.

Limestone [marble]. Fine; white; crystalline. Slab, 6 inches square. Vera Cruz. Mexican Geographical Exploring Commission, 1885. 37759.

—— White, with rust spots; crystalline. Slab, 6 inches square. State of Sonora. Mexican Geographical Exploring Commission, 1885. 37760.

Limestone [marble]. White; crystalline. Slab, 6 inches square. State of Sonora. Mexican Geographical Exploring Commission, 1885. 37814.

—— White; crystalline. Zumpango, State of Mexico. Mexican Geographical Exploring Commission, 1885. 37715.

—— Dull pinkish; fine and compact. Slab, 6 inches square. Tecali, State of Puebla. Mexican Geographical Exploring Commission, 1885. 37729.

—— Cretaceous. Water-blue and gray; fossiliferous. Three specimens. Tezintlan, State of Puebla. Mexican Geographical Exploring Commission, 1885. 37998.

Limestone. Drab; fine and compact. State of Puebla. Mexican Geographical Exploring Commission, 1885. 38126.

Travertine [Mexican onyx]. Paper-weight, composed of a red kidney-shaped body on a white base, 3 by 3 by 2 inches. State of Puebla. Purchased, 1885. 37593.

—— Paper-weight. State of Puebla. Purchased, 1885. 37594.

—— Nearly colorless; transparent. Irregular slab, 6 by 3 by ¼ inch. State of Tecali, Puebla. Mexican Geographical Exploring Commission, 1885. 37596.

—— Paper-knife, 7½ inches long. State of Puebla. Purchased, 1885. 37595.

—— Nearly white; 7½ by 5½ by ½ inch. State of Puebla. Charles E. Hall & Co., 1884. 36757.

—— Light green and white. Three blocks, one 7½ by 7½ by 6 inches, and two 4 by 4 by 1½ inches; also three thin slabs of the same, mounted on stands, to show veination. Tecali, State of Puebla. Mexican Geographical Exploring Commission, 1885. 37640.

Travertine. Light variegated; 6½ by 11½ by 2 inches. State of Aguas Calientes. Mexican Geographical Exploring Commission, 1885. 37642.

Tuff. Light colored; coarsely vesicular. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37709.

—— Fine; pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37710.

—— Fine; light colored; soft and pliable. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37694.

—— Fine; salmon color. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37718.

—— Pink. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37785.

—— Fine; light pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37713.

—— Coarsely porous; light pink. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37781.

—— Coarse; light reddish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37782.

—— Nearly white, streaked with yellow and red. Two specimens. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37743.

—— Light colored; slightly pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37738.

—— Very light pinkish. Santa Cruz, State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37732.

—— Compact. Five-inch cube. Two specimens. State of Zacatecas. J. S. F. Batchen, 1884. 36805.

—— Compact; reddish. Five-inch cube. State of Zacatecas. J. S. F. Batchen, 1884. 36804.

Tuff. Gray. Carved block, 8 by 8 by 6 inches. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37806.

—— Green. Carved block, 10½ by 8 by 4 inches. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37704.

—— Green. Carved block, 10½ by 8 by 4 inches. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37705.

—— Red. Carved block, 11 by 6 by 7 inches. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37706.

—— Green. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37724.

—— Brown. Carved block, 11 by 8½ by 5 inches. State of Hidalgo. Mexican Geological Exploring Commission, 1885. 37788.

—— Purplish gray. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37751.

—— Compact; red, purplish, and white mottled. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37764.

—— Light colored, with dark reddish spots. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37797.

—— Medium; light lavender. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37819.

—— Compact; gray, with reddish spots. Six-inch cube. State of Morelos. Mexican Geographical Exploring Commission, 1885. 37720.

—— Compact; light reddish-brown. Six-inch cube. State of Morelos. Mexican Geographical Exploring Commission, 1885. 37721.

—— Very light gray; vesicular. Mexican Geographical Exploring Commission, 1885. 37692.

—— Gray; coarsely vesicular. Vera Cruz. Mexican Geographical Exploring Commission, 1885. 37992.

—— Coarse; gray. State of Puebla. Mexican Geographical Exploring Commission, 1885. 37793.

—— Fine; very light brown. Five-inch cube. Lagos, State of Jalisco. J. S. F. Batchen, 1884. 36800.

—— Light brownish; cellular. Five-inch cube. Lagos, State of Jalisco. J. S. F. Batchen, 1884. 36799.

—— Fine; light colored. Five-inch cube. State of Aguas Calientes. J. S. F. Batchen, 1884. 36802.

—— Light red. La Paz, Lower California. Mexican Geographical Exploring Commission, 1885. 38002.

—— Compact; reddish. Five-inch cube. State of Queretaro. J. S. F. Batchen, 1884. 36793.

—— Fine; very light brown. Five-inch cube. Leon, State of Guanajuato. J. S. F. Batchen, 1884. 36797.

—— Light colored; porous. Five-inch cube. Leon, State of Guanajuato. J. S. F. Batchen, 1884. 36798.

—— Coarse; light greenish-gray. Mexican Geographical Exploring Commission, 1885. 37719.

—— Red; friable. Mexican Geographical Exploring Commission, 1885. 37999.

Tuff (?). Compact; light reddish-brown. Six-inch cube. State of Morelos. Mexican Geographical Exploring Commission, 1885. 37722.

—— Gray, streaked with ferruginous red. Six-inch cube. State of Morelos. Mexican Geographical Exploring Commission, 1885. 37723.

Rhyolite tuff. Reddish; coarse and friable. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37756.

—— Fine; light gray. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37757.

—— Fine; light fawn colored. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37717.

—— Fine; nearly white. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37810.

—— Coarse; light colored; soft and friable. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37740.

—— Light colored; soft and friable. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37742.

—— Fine; light pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37775.

—— Fine; pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37776.

—— Coarse, light pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 3778.

—— Fine; light lavender. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37779.

—— Fine; light greenish gray. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37784.

—— Light pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1875. 37737.

—— Very light gray. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37731.

—— Fine; light reddish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37733.

—— Compact; light green. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37747.

—— Compact; light green. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37750.

—— Coarse; light green. Zumpango, State of Mexico. Mexican Geographical Exploring Commission, 1885. 37725.

—— Fine; very light colored; soft and friable. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37749.

—— Coarsely vesicular; yellowish. Mexican Geographical Exploring Commission, 1885. 37714.

—— Fine; nearly white, streaked with red and yellow. Mexican Geographical Exploring Commission, 1885. 37736.

Rhyolite (?) tuff. Coarse; red. Huelmetoca. Mexican Geographical Exploring Commission 1885. 37691.

Rhyolite. Brownish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37994.

—— Compact; light reddish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37730.

—— Brownish gray. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37758.

—— Fine; pinkish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37744.

Rhyolite. Fine; very light colored. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37745.

—— Fine; light brown. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37748.

—— Light red. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37746.

—— Fine; light lavender, pink and light colored; friable. Three specimens. State of Aguas Calientes. Mexican Geographical Exploring Commission, 1885. 37766.

—— Reddish; 5-inch cube. 'Leon, State of Guanajuato. J. S. F. Batchen, 1884. 36796.

—— Fine; light colored. State of San Luis Potosi. Mexican Geographical Exploring Commission, 1885. 37739.

—— Gray; 5-inch cube. J. S. F. Batchen, 1884. 36790.

—— Light colored. Santa Rosa. Mexican Geographical Exploring Commission, 1885. 37689.

—— Gray; 5-inch cube. San Joaquin. J. S. F. Batchen, 1884. 36801.

Rhyolite pitchstone (?). Bluish gray; glassy. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37768.

Andesite. Reddish; fine and compact. State of Mexico. J. S. F. Batchen, 1884. 36791.

—— Dark gray; finely vesicular. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37800.

Andesite (?). Dark gray; fine and compact. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37807.

—— Brown. Tenacingo, State of Mexico. Mexican Geographical Exploring Commission, 1885. 37772.

—— Fine; dull red. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37769.

Hypersthene andesite. Reddish. Carved block 13 by 9 by 4 inches. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37771.

—— Light colored. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37707.

—— Medium; light brownish. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37783.

—— Finely vesicular; reddish. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37712.

—— Black; finely vesicular. Ixtapalapa, State of Mexico. Mexican Geographical Exploring Commission, 1885. 37789.

Hornblende andesite. Compact; gray. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37752.

—— Fine; light red. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37770.

—— Fine; very light gray. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37703.

—— Fine; reddish brown. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37735.

—— Fine; dull red. Tenamingo, State of Mexico. Mexican Geographical Exploring Commission, 1885. 37741.

—— Coarse; light gray. Ixtapalapa, State of Mexico. Mexican Geographical Exploring Commission, 1885. 37711.

Hornblende andesite (?). Reddish gray. San Juan de los Llanos, State of Puebla. Mexican Geographical Exploring Commission, 1885. 38001.

Basalt. Dark gray; vesicular, with large olivines. State of Zacatecas. Mexican Geographical Exploring Commission, 1885. 37786.

—— Gray; vesicular. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37754.

—— Gray; vesicular. State of Oaxaca. Mexican Geographical Exploring Commission, 1885. 37755.

—— Light gray; coarsely and finely vesicular. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37701.

—— Nearly black; vesicular. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37799.

—— Nearly black; finely and coarsely vesicular. Two specimens. State of Puebla. Mexican Geographical Exploring Commission, 1885. 37699.

—— Dark brown; coarsely vesicular. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37802.

—— Black; coarsely vesicular. Tula, State of Mexico. J. S. F. Batchen, 1884. 36792.

Basalt (?). Fine; reddish brown. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37808.

—— Reddish brown; vesicular. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37700.

—— Dark brown; coarsely vesicular. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37798.

—— Dull red; very vesicular. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37773.

—— Reddish brown; vesicular. San Miguel, San Salvador (?). Mexican Geographical Exploring Commission, 1885. 37687.

—— Reddish brown; finely vesicular. Toluca. Mexican Geographical Exploring Commission, 1885. 38128.

Basalt (?) tuff. Black; friable. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37792.

Basaltic (?) tuff. Dull grayish; finely vesicular. San Miguel. Mexican Geographical Exploring Commission, 1885. 37690.

Pumice. Fine; light gray. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37804.

—— Gray; finely and coarsely vesicular. Two specimens. San Juan de los Llanos, State of Puebla. Mexican Geographical Exploring Commission, 1885. 37698.

Pumice tuff. Compact; very light gray; soft and friable. State of Hidalgo. Mexican Geographical Exploring Commission, 1885. 37809.

Dacite. Fine; light reddish. State of Mexico. Mexican Geographical Exploring Commission, 1885. 37716.

Sandstone. Greenish. 5 by 4 by 3½ inches. State of Guanajuato. J. S. F. Batchen, 1884, 36794.

—— Greenish. 5 by 4 by 3½ inches. State of Guanajuato. J. S. F. Batchen, 1884. 36795.

—— Light brown. 5-inch cube. State of Aguas Calientes. J. S. F. Batchen, 1884. 36803.

—— Fine; gray. State of Morelos. Mexican Geographical Exploring Commission, 1885. 37997.

(4) South America.

Marble. Light green, dark veined; very compact. 6 by 6 by 1 inches. Encruzilhada, Province of Rio Grande do Sul, Brazil. American Institute of Mining Engineers, 1885. 37835.

Marble [bituminous limestone]. Black with irregular white veins. 6 by 6 by 1 inches. Province of Sao Paulo, Brazil. American Institute of Mining Engineers, 1885. 37837.

Marble [ophicalcite]. Light and dark green banded. 6 by 6 by 1 inches. Province of Sao Paulo, Brazil. American Institute of Mining Engineers, 1885. 37838.

Marble [limestone]. Fine; green and dark mottled; crystalline. 6 by 6 by 1 inch. Brazil. American Institute of Mining Engineers, 1885. 37839.

Building stone. Dark gray and pinkish. Four specimens. 4 by 4 by 2½ inches. Argentine Confederation. Centennial, 1876. 25072.

Biotite gneiss. Memorial stone from the Washington Monument. Brazil. D. O'Leary, 1885. 37629.

(5) Great Britain.

ENGLAND.

Serpentine. Dark olive-green, with veins, streaks, and blotches of greenish white, chocolate brown, and blood red. Six specimens. 4½ by 5 by 1½; 4⅝ by 4⅝ by 1½; 7½ by 4 by ⅝; 5 by 3½ by 1½; 4⅝ by 3½ by 1½ and 4½ by 2½ by 1 inch. Lizard district, Cornwall. R. N. Worth, 1887. 39011.

Slate. Purple. Slab 8 inches square. Two specimens. North Wales. Centennial, 1876. 26030.

—— Model of a roof, showing the timber framing, with the method of fixing the slate. 24 inches long, 18 inches broad, and 12 inches high. North Wales. Centennial, 1876. 36999.

—— Blue-black and purple. Two specimens. Carnarvon, North Wales. Centennial, 1876. 37000.

SCOTLAND.

Hornblende granite. Polished column of; coarse red. 8 by 3½ inches. Aberdeen. A. Macdonald, Field & Co. 27011.

—— Polished column of; coarse gray. 8 by 3½ inches. Aberdeen. A. Macdonald, Field & Co. 27010.

Biotite granite. Polished column of; coarse red. 8 by 3½ inches. Aberdeen. A. Macdonald, Field & Co. 27012.

—— Polished column of; coarse gray, with large porphyritic crystals of pink feldspar. 8 by 3½ inches. Aberdeen.* A. Macdonald, Field & Co. 27013.

—— Polished column of; dark gray. 8 by 3½ inches. Aberdeen. A. Macdonald, Field & Co. 27009.

Muscovite biotite granite. Polished column of; light gray. 8 by 3½ inches. Aberdeen. A Macdonald, Field & Co. 27008.

Muscovite granite. Coarse; very light gray. 4 by 4 by 1½ inches. Aberdeen. Thomas Wilson, 1887. 38825.

Sandstone. Carboniferous; fine; light red. Ballochmyle. Tenth Census, 1880. 26668.

—— Permian; fine; dull red. Near Anan. Tenth Census, 1880. 27349.

* This stone is probably from Shap, in Cumberland, England.

Sandstone. Permian; fine; red. 18-inch cube. Near Anan. John S. F. Batchen, 1883. 27350.

—— Medium; light colored. Burg-Head, Moray. John S. F. Batchen, 1883. 28588.

—— Coarse; light colored. Elgin, Moray. John S. F. Batchen, 1883. 28589.

—— Devonian; fine; light colored. Nairn, Nairn. John S. F. Batchen, 1883. 28590.

—— Devonian; medium; buff. Thurso, Caithness. John S. F. Batchen, 1883. 28591.

—— Fine; pinkish. Near Elgin, Moray. John S. F. Batchen, 1883. 28592.

—— Fine; light colored. Near Brora, Sutherland, John S. F. Batchen, 1883. 28594.

—— Fine; light colored. Golspie, Sutherland. John S. F. Batchen, 1883. 28595.

—— Fine; light colored. Tortrose, Ross. Suddie's quarry. John S. F. Batchen, 1883. 28596.

—— Fine; very light red. Beauty, Ross. Tarradale quarry. John S. F. Batchen, 1883. 28597.

(6) Europe.

BELGIUM.

Marble. Dark gray, nearly black, with white veins. 4½ by 4½ by ⅝ inches. Conillet, near Charleroi, Province of Hainaut. L. Charpy, 1886. 38268.

—— Gray and white; breccia. 4½ by 4½ by ⅝ inches. Conillet, near Charleroi, Province of Hainaut. L. Charpy, 1886. 38272.

—— White; pink mottled. 4½ by 4½ by ⅝ inches. Merlemont, near Philippeville, Province of Namur. L. Charpy, 1886. 38274.

Marble [rouge royal]. Pink, with white veins. 4½ by 4½ by ⅝ inches. Cerfontaine, near Philippeville. L. Charpy, 1886. 38273.

Saint Ann marble. Very dark gray, nearly black. 4½ by 4½ by ⅝ inches. Busnie, Province of Namur. L. Charpy, 1886. 38277.

Marble [rouge impérial]. Dark red and gray mottled. Cerfontaine, near Philippeville. L. Charpy, 1886. 38306.

Marble [rouge griotte fleuri]. Dark red and white mottled. 4½ by 4½ by ⅝ inches. Cerfontaine, near Philippeville. L. Charpy, 1886. 38307.

Marble [rouge griotte]. Dull red, with gray spots. 4½ by 4½ by ⅝ inches. Cerfontaine, near Philippeville. L. Charpy, 1886. 38325.

BAVARIA.

Lithographic limestone. Light colored. 7½ by 7 by 3 inches. John S. F. Batchen, 1884. 35706.

—— Drab. 2 by 8½ by 6½ inches. Solenhofen. A. G. Gedney, Washington, D. C. 1884. 35888.

Granite. Coarse; reddish brown. Piece of memorial stone from Washington Monument. Dennis O'Leary, 1885. 37627.

FRANCE.

Limestone. Very light buff. Caen. Ellin & Kitson, New York. 26695.

Marble [French griotte]. Dark red. Slab about 6 by 7 by ⅝ inches. Charles Lippincott & Co., Philadelphia. 35927.

Marble [Breche du Rousillon (?)]. Dull red, with coarsely anastomising and very irregular light-drab and yellow veins. 15 by 18 by 1 inches. Pyrénées Orientales (?). Centennial Commission, 1876. 37474.

Marble [Sampans petit grain]. Dull pink; oolitic. 4 by 4 by ⅝ inches. Sampans, Jura. L. Charpy, 1886. 38269.

Marble [griotte]. Dark red. 3½ by 2½ by ½ inches. Carcassone, Aude. L. Charpy, 1886. 38270.

Fossil marble [Sampans jaune doré]. Yellow; coarsely oolitic. 4 by 4 by ⅝ inches. Sampans, Jura. L. Charpy, 1886. 38271.

Marble [Sampans grain doré]. Dull red. 4 by 4 by ⅝ inches. Sampans, Jura. L. Charpy, 1886. 38275.

Marble. Very light yellow. 4 by 4 by ⅝ inches. Belvoye, Jura. L. Charpy, 1886. 38276.

Marble [Sampans rouge antique]. Dull red. 4 by 4 by ⅝ inches. Sampans, Jura. L. Charpy, 1886. 38279.

Jasper marble. Pink and yellow mottled. 4½ by 3 by ⅝ inches. L'Ablage, Damparis, Jura. L. Charpy, 1886. 38280.

GERMANY.

Marble [bougard]. Gray, with white and yellowish tints. Slab 12 by 2 by 1 inches. Nassau. Gift of E. Fritsch, New York.

Marble [formosa]. Blue-gray and drab; some yellow spots. Slab 12 by 12 by 1 inches. Nassau. Gift of E. Fritsch, New York.

ITALY.

Serpentine [verd-antique marble]. Dark green; white veined. 4 by 4 by 1 inches. Genoa. W. W. Story, 1883. 28633.

—— Greenish, with white veins. 4 by 4 by 1 inches. W. W. Story, 1883. 28639.

—— Green; white veined; first quality. 4 by 4 by 1 inches. Genoa quarry. W. T. Rice, 1882. 26906.

Marble. White; dark spotted. Col. Edw. Clark, 1880. 25005.

—— White, with dark veins. 3-inch cube. Serravezza. J. W. Tufts, Boston, 1881. 26164.

—— Red mixed. 3½ by 5 by 1½ inches. Levanto, 1881. 26449.

—— Black and gold. Slab about 5½ by 6½ by 1 inches. Specia, 1881. 26452.

—— Pure white; statuary; first quality. 12-inch cube. Poggio Silvestro quarry. William T. Rice, 1882. 26879.

—— White, with dark spots; statuary; second quality. 12-inch cube. William T. Rice, 1882. 26880.

—— White; ordinary; second quality. 12-inch cube. William T. Rice, 1882. 26881.

—— White; statuary; second quality. 12-inch cube. William T. Rice, 1882. 26882.

—— White; ordinary; first quality. 12-inch cube. William T. Rice, 1882. 26883.

—— White; dark veined; second quality. 8½-inch cube. Gioja quarry. William T. Rice, 1882. 26884.

—— Light blue-gray; Bardiglio; second quality. 12-inch cube. Gioja quarry. William T. Rice, 1882. 26885.

—— Light blue; dark veined; Bardiglio; first quality. 10½-inch cube. William T. Rice, 1882. 26886.

Marble. Light blue; Bardiglio veined; second quality. 11-inch cube. William T. Rice, 1882. 26887.

—— Pink; Breccia; first quality; 4 by 4 by 1 inches. Serravezza quarry. William T. Rice, 1882. 26888.

—— Light drab; pink veined. Breccia; first quality. 4 by 4 by 1½ inches. Gragnana quarry. William T. Rice, 1882. 26889.

—— Yellow; first quality. 4 by 4 by 1½ inches. Gragnana quarry. William T. Rice, 1882. 26890.

—— Pinkish; Breccia; first quality. 4 by 4 by 1½ inches. Gragnana quarry. William T. Rice, 1882. 26891.

—— White; ordinary; first quality. 12-inch cube. William T. Rice, 1882. 26892.

—— White; ordinary; second quality. 12-inch cube. William T. Rice, 1882. 26893.

—— White; statuary; second quality. 12-inch cube. William T. Rice, 1882. 26894.

—— White; veined; first quality. 12-inch cube. Vara quarry. William T. Rice, 1882. 26892.

—— Blue; Bardiglio; first quality. 12-inch cube. William T. Rice, 1882. 26896.

—— Black and gold. 12-inch cube. William T. Rice, 1882. 26897.

—— Red mixed; first quality. 11 by 11 by 6 inches. William T. Rice, 1882. 26898.

—— White; dark veined. Paunazo; first quality. 8½ by 8½ by 5 inches. Miseglia quarry. William T. Rice, 1882. 26899.

—— White; dark veined; Pannazo; first quality. 6 by 6 by 4½ inches. Pescina quarry. William T. Rice, 1882. 26900.

—— Green; Breccia; first quality. 4 by 4 by 1 inches. Garfagnana quarry. William T. Rice, 1882. 26905.

—— Deep yellowish pink; first quality. 4 by 4 by ½ inches. Verona quarry. William T. Rice, 1882. 26907.

—— Brown; first quality. 4 by 4 by 1 inches. Castel Poggia quarry. William T. Rice, 1883. 26908.

—— White; dark veined; Paunazo; first quality. 6-inch cube. William T. Rice, 1882. 26901.

—— Yellow. 6-inch cube. William T. Rice, 1882. 26902.

—— Marble; black; first quality. 12-inch cube. Collonnata quarry. William T. Rice, 1882. 26904.

—— Pure white. 4 by 4 by ½ inc hes. Carrara. Grestola quarry. W. W. Story, 1883. 28603.

—— White; clouded. 4 by 4 by ½ inches. Carrara. W. W. Story, 1883. 28604.

—— White; ordinary; second quality. 4 by 4 by ½ inches. Carrara. Fantiscritti quarry. W. W. Story, 1883. 28605.

—— White; dark veined. 4 by 4 by ½ inches. Carrara. Canale Bianco quarry. W. W. Story, 1883. 28606.

—— Pure white; statuary first quality. 4 by 4 by ½ inches. Carrara. Mossa Cava quarry. W. W. Story, 1883. 28607.

—— Pure white. 4 by 4 by ½ inches. Carrara. Poggio Silvestro quarry. W. W. Story, 1883. 28608.

—— White; first quality. 4 by by 4 by ½ inches. Carrara. Canale Bianco quarry. W. W. Story, 1883. 28609.

—— Deep blue-gray; nearly black. Nero di Colona. 4 by 4 by ½ inches. Carrara. W. W. Story, 1883. 28610.

—— Pure white. 4 by 4 by 3½ inches. Carrara. Carpevola quarry. W. W. Story 1883. 28611.

Marble. White; slightly bluish; ordinary. 4 by 4 by ¾ inches. Carrara. Ravaccione quarry. W. W. Story, 1883. 28612.

—— Red mixed. 4 by 4 by 1 inch. Specia. Rosso di Levante quarry. W. W. Story, 1883. 28613.

—— Black and gold. 4 by 4 by ¾ inches. Specia. Porto Venere quarry. W. W. Story, 1883. 28614.

—— White. 4 by 4 by 1 inches. Serravezza. W. W. Story, 1883. 28620.

—— White and dark; brecciated. 4 by 4 by 1 inches. Serravezza. W. W. Story, 1883. 28621.

—— Pure white statuary; first quality. 5½ by 3¾ by ½ inches. Serravezza. W. W. Story, 1883. 28622.

—— White; Bianco Falcovaia. 4 by 4 by ¾ inches. Serravezza. W. W. Story, 1883. 28623.

—— White; Bianco Chiaro. 4 by 4 by ¾ inches. Serravezza. W. W. Story, 1883. 28624.

—— White; statuary. 4 by 4 by ¾ inches. Serravezza. W. W. Story, 1883. 28625.

—— Blue veined (fiorito). 4 by 4 by ¾ inches. Serravezza. W. W. Story, 1883. 28626.

—— Blue veined (fiorito); first quality. 4 by 4 by ¾ inches. Serravezza. W. W. Story. 1883. 28627.

—— Pink and white (mischio). 4 by 4 by 1 inches. Serravezza. W. W. Story, 1883. 28628.

—— Blue (Bardiglio). 4 by 4 by ¾ inches. Serravezza. W. W. Story, 1883. 28629.

—— Pinkish (Umbria). 5¾ by 3¾ by ½ inches. Umbria. W. W. Story, 1883. 28630.

—— Light fawn color. 4 by 4 by 1 inches. Umbria. W. W. Story, 1883. 28632.

—— Red. 4 by 4 by 1 inches. Perugia. Rosso di Perugia quarry. W. W. Story, 1883. 28634.

—— Nearly black. 4 by 4 by 1 inches. Lavagno. W. W. Story, 1883. 28640.

—— White. 4 by 4 by ¾ inches. Arni. L. Charpy, 1886. 38278.

—— White, dark, spotted. 4 by 4 by ¾ inches. Piastraccin, near Arni. L. Charpy, 1886. 38281.

Breccia marble. Red and white with dark spots; a fine breccia. 5¾ by 3¾ by ½ inches. Monte Cavo. W. W. Story, 1883. 28631.

—— Black, yellow veined. Portoro. First quality. 6 by 6 by 3 inches. Monte d' Arma quarries. William T. Rice, 1882. 26903.

Bardiglio marble. Light blue-gray; mottled. 4 by 4 by ¾ inches. Gioja. W. W. Story, 1883. 28601.

—— Light blue-gray; dark veined. 4 by 4 by ¾ inches. Gioja. W. W. Story, 1883. 28602.

Marble [fior di Persico]. Four by 4 by ¾ inches. W. W. Story, 1883. 26615.

—— Chocolate red and white; mottled. 5½ by 3½ by ¾ inches. W. W. Story, 1883. 26616.

—— Red, mixed. 4 by 4 by ¾ inches. Levanto. W. W. Story, 1883. 28617.

Marble [giallo di Siena]. Yellow. Four specimens. 2½ by 4 by ½ inches. Cappadocia. W. W. Story, 1883. 28618.

—— Yellow and purplish; brecciated. Two specimens. 2½ by 4 by ½ inches. Cappadocia. W. W. Story, 1883. 28619.

Travertine. Nearly white; porous. 4 by 4 by 1 inches. Tivoli. W. W. Story, 1883. 28641.

Travertine. Yellowish. This stone is popularly called "alabaster." 4 by 4 by 1 inches. Civita Vecchia. W. W. Story, 1883. 28637.

—— Yellowish; called "alabaster." 4 by 4 by 1 inches. W. W. Story, 1883. 28638.

Limestone. One of the principal building stones throughout Tuscany and Northern Italy. Is used for fine work, door and window trimmings, and facings of the basements of houses, especially in Florence. Does not withstand the climate for a longer period than twenty years. 12 by 8 by 8 inches. Florence, Italy. Hon. William T. Rice, United States consul at Leghorn, Italy, 1882. 27025.

—— A coarse hard limestone used for door and window trimmings and facings for the basements of houses. It is one of the principal building stones in use throughout Tuscany and Northern Italy; 12 by 8 by 8 inches. Leghorn, Italy. Hon. William T. Rice, United States consul at Leghorn, Italy, 1882. 27026.

—— A coarse stone used generally for paving streets. Is also one of the principal building stones used throughout Tuscany and Northern Italy. 12 by 8 by 8 inches. Leghorn, Italy. Hon. William T. Rice, United States consul at Leghorn, Italy, 1882. 27027.

—— Breccia Di Nugola. One of the principal stones used for house trimmings and similar work throughout Tuscany and Northern Italy. Many of the old palaces are faced with it. The stone is soft when quarried, but hardens on exposure. 12 by 8 by 8 inches. Leghorn, Italy. Hon. William T. Rice, United States consul at Leghorn, Italy, 1882. 27028.

—— Hard travertine. A hard, fine-grained limestone used for general building purposes. Was much used in old times in building palaces. Is one of the principal building stones used throughout Tuscany and Northern Italy. 12 by 8 by 8 inches. Leghorn, Italy. Hon. William T. Rice, United States consul at Leghorn, Italy, 1882. 27029.

—— Travertine of Tarrana. One of the principal stones used for house-trimmings and monuments throughout Tuscany, and in general use in the North of Italy. Is a soft stone, but is said to stand the weather well. 12 by 8 by 8 inches. Leghorn, Italy. Hon. William T. Rice, United States consul at Leghorn, Italy, 1882. 27030.

—— An ordinary stone from quarries around Leghorn. Is used generally only where it is to be covered with mortar. Rarely used for firm work. One of the principal building stones throughout Tuscany and Northern Italy. 12 by 8 by 8 inches. Leghorn, Italy. Hon. William T. Rice, United States consul at Leghorn, Italy, 1882. 27031.

Granite. Coarse; light gray. 6-inch cube. Milan. Montorfina quarry. William T. Rice, 1882. 26909.

—— Fine; dark gray. 6-inch cube. Milan. Biella quarry. William T. Rice, 1882. 26910.

—— Coarse; light pink. 6-inch cube. Milan. Bavena Quarry. William T. Rice, 1882. 26911.

Quartzite. A natural slab. 4 feet 8¼ inches long, 3 feet 4 inches wide, and 1 inch thick. Luserna. Centennial, 1876. 25207.

Volcanic tuff. (Peperino.) 4 by 4 by 1 inches. Marino. W. W. Story, 1883. 28635.

Sandstone. Micaceous; blue-gray. 4 by 4 by 1 inches. W. W. Story, 1883. 28636.

PORTUGAL.

Limestone. Light colored; fine and compact. From quarries at Ontil, Cantanhede, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27782.

Limestone. Very light drab; fine and compact. From quarries at Ilhostro, Coimbra, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27786.

—— Light colored; fine and compact. Locality, etc., the same as last. 27779.

—— Light pink tinted; fine and compact. From quarries at Zambujal, Cantanhede, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27781.

—— Light drab; fine and compact. From quarries at Pampilhora, Coimbra, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27787.

—— Buff; fine and compact; with many small veins. Used for making quicklime. From quarries at Covoez, Cantanhede, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27757.

—— Light colored; fine and compact. Used for making quicklime. Quarries at Ega, Condeixa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27745.

—— Gray; fine and compact. Locality, etc., as above. 27791.

—— Light colored; fine and compact. Locality, etc., same as above. 27793.

—— Very light drab; fine and compact. Quarries at Loureira, Condeixa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27748.

—— Lithographic; very light brown; compact; finely fossiliferous. From quarries at Pedreiras do Coiço, Condeixa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27755.

—— Light colored; very fine and compact. From quarries at Alto do Sangradas, Condeixa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27746.

—— Dark gray; fine and compact. From quarries at Cape Mondego, Beira Province. Centennial, 1876. 27803.

—— Dark gray; fine and compact. Cape Mondego, Beira Province. Centennial, 1876. 27802.

—— Very dark gray; fine and compact. From quarries at Dta. de Sto. Amero, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27805.

—— Light yellowish brown; very fine and compact. From quarries at Forrestillo, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27814.

—— Light colored; fine and compact. From quarries at Boria, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27809.

—— Light colored; fine and compact. From quarries at Brenha, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27811.

—— Drab and yellow; fine and compact. Locality, etc., same as last. 27812.

—— Light colored; finely fossiliferous. From quarries at Salmanha, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27798.

—— Light colored; compact; fossiliferous. Locality, etc., same as last. 27795.

—— Drab; fine and compact. From quarries at Arrovella, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27751.

Limestone. Drab; fine and compact; semi-crysta lline. Penella, Beira Province. 27726.

—— Gray; fine and compact. Locality, etc., same as above. 27728.

—— Very light brown; fine and compact. Locality, etc., same as above. 27739.

—— Light colored; fine and compact. Quarries at Verride, Monte Mor-Velho, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27747.

—— Coarse; light colored. From quarries at Penacora e Friumes, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27753.

—— Light yellowish; compact; oolitic. From quarries at Alrito, Poiares, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27721.

—— Light colored; fine and vesicular. Quarries at Ponte do Espinhal, Penella, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27743.

—— Lithographic; dull brownish; compact. Bordallo, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27783.

—— Compact; light colored; oolitic. From quarries at Lombas, Batalha, District of Leiria. American Institute of Mining Engineers, 1886. 37899.

—— Coarse; drab. From quarries at Corredara, Porto de Moz, District of Leiria. Estremadura Province. American Institute Mining Engineers, 1886. 37900.

—— Dark blue-gray, nearly black; fine and compact. Locality, etc., same as above. 37901.

—— Compact; light red. From quarries at Nazareth, Alcobaca, District of Leiria, Estremadura Province. American Institute of Mining Engineers, 1886. 37902.

—— Pinkish; fine and compact; crystalline. Locality, etc., same as above. 37903.

—— Light colored; compact; finely fossiliferous. American Institute of Mining Engineers, 1886. 37921.

Limestone, argillaceous. Dendritic; light yellow; fine and compact. From quarries at Cuzelhas, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27784.

—— Fine; very light colored. From quarries at Ançan, Cantanhede, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27780.

—— Drab; fine and compact. Quarries at Ega, Condeixa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27758.

—— Very light colored; fine and compact. From quarries at Alhadas, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27808.

—— Bluish drab; very fine and compact. From quarries at Serra da Boa Viagem, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27804.

—— Nearly white; chalky. From quarries at Carvalhal, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27810.

—— Light drab and gray. Quarries at Porto Barrao, Montemor Velho, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27750.

—— Very light colored; fine and compact. Quarries at Janianes, Penella, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27744.

—— Light drab; fine and compact. From quarries at Janianes, Penella, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27816.

Limestone Breccia. Brown; from quarries at Monte Arrvia, Coimbra, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27785.

Limestone [marble]. Light yellow; fine and compact. From quarries at Andoriuha, Cantanhede, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27778.

—— Light pinkish drab; fine and compact. Quarries at Condeixa a Velha, Condeixa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27788.

—— Red and yellow; mottled; fine and compact. Two specimens. Locality, etc., same as last. 27789.

—— Pink and yellow mottled, with dark spots; fine and compact. Locality, etc., same as last. 27790.

—— Very light colored; fine and compact. From quarries at Amaxoeira, Condeixa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27792.

—— Compact; pinkish. Quarries at Arneiro de fora, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27742.

—— Light lavender; very fine and compact. From quarries at Pincho, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27806.

—— White, dark spotted; very fine and compact. From quarries at Zameirao, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27754.

—— Light colored; compact; fossiliferous. Locality, etc., same as last. 27799.

—— Pink; fine and compact. Locality, etc., same as last. 27796.

—— Light pink; fine and compact. Locality, etc., same as last. 27797.

—— Very light colored, pink tinted; fine and compact. Locality, etc., same as last. 27807.

—— Light pink; fine and compact. From quarries at Farrestello, Figueira da Foz, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27813.

—— Gray; crystalline. 8 by 8 by 1 inches. Quarries at Alveite, Poiares, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27720.

—— Yellow, with light purple stripes; very fine and compact. From quarries denominated *Ferrarias, Fabricas, Ledadura,* and *Lobral,* situated in the "Freguesias" of St. Miguel and Santa Eufemia, Penella, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27725.

—— Light drab; very fine and compact. Locality, etc., same as above. 27815.

—— Light brown with streaks of dull red; fine and compact. Locality, etc., same as above. 27727.

—— Dull pinkish with fine veins of white calcite. Very fine and compact. Locality, etc., same as above. 27729.

—— Dull red; very fine and compact. Locality, etc., same as above. 27730.

—— Drab, pink tinted; very fine and compact. Locality, etc., same as above. 27731.

—— White crystalline, spotted and blotched with light red; very fine and compact. Locality, etc., same as above. 27732.

—— Yellow-tinged with pink, with vein of white calcite; very fine and compact. Locality, etc., same as above. 27734.

—— Very light pinkish; fine and compact, with many minute veins. Locality, etc., same as above. 27735.

Limestone [marble]. Dull red with light streaks; very fine and compact. From quarries denominated *Ferrarias*, *Fabricas*, *Ledadura*, and *Lobral*, situated in the "Freguesias" of St. Miguel and Santa Eufemia, Penella, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27736.

—— Light pink with drab veins; very fine and compact. Locality, etc., same as above. 27737.

—— Very light brown with dull red stripes; very fine and compact. Locality, etc. same as above. 27738.

—— Very light pink; fine and compact. Locality, etc., same as above. 27740.

—— Drab with pink and yellow streaks; fine and compact. Locality, etc., same as above. 27741.

—— Dull reddish brown; very fine and compact. Locality, etc., same as above. 27733.

—— Light and dark gray mottled; crystalline. 8 by 8 by 1 inches. From the quarries of the Estremoz Marble Quarrying Company, Estremoz, Alemtejo Province. American Institute of Mining Engineers, 1886. 37914.

—— White; crystalline. 8 by 8 by 1 inches. Locality, etc., same as above. 37915.

—— White; crystalline. 8 by 8 by 1 inches. Locality, etc., as above. 37916.

—— Same as above. 37917.

—— Yellowish white, with red blotches; crystalline. 8 by 8 by 1½ inches. Locality, etc., same as above. 37918.

—— White; crystalline. 10½ by 10½ by ½ inches. Locality, etc., same as above. 37911.

—— White with yellow veins; crystalline. 8 by 8 by 1 inches. From quarries at Estremoz, Alemtejo Province. Portuguese Centennial Commission, 1876. 27723.

—— Yellow. 10½ by 10½ by ½ inches. Locality, etc., same as above. 27671.

—— Very light drab. 10½ by 10½ by 1 inches. From quarries at Porto Salvo, Alemtejo Province. American Institute of Mining Engineers, 1886. 37913.

—— White; crystalline. 8 by 8 by 1 inches. From quarries and Vianna do Alemtejo. American Institute of Mining Engineers, 1886. 37919.

—— White; crystalline. 8 by 8 by 1 inches. From quarries at Borba, Alemtejo Province. American Institute of Mining Engineers, 1886. 37920.

—— Dark blue gray and white mottled; crystalline. 6-inch cube. Locality as above. Portuguese Centennial Commission, 1876. 27724.

—— Pink mottled. 10½ by 10½ by ½ inches. Quarries at Pero Pinheiro Estremadura Province. Two specimens. Portuguese Centennial Commission, 1876. 27666.

—— Light red; mottled. 10½ by 10½ by ½ inches. Locality, etc., same as above. 27667.

—— Very light drab. 10½ by 10½ by ½ inches. Locality, etc., same as above. 27668.

—— Water blue; coarsely crystalline. 10½ by 10½ by ½ inches. Locality, etc., same as above. 27669.

—— Light and dark red. Two specimens. 10½ by 10½ by ½ inches. Locality, etc., same as above. 27673.

—— Light colored; fossiliferous. Locality, etc., same as above. American Institute of Mining Engineers, 1886. 37912.

—— Dull pink; very fine and compact. From the quarries of Joaquim Pires, Serra da Lagar, Anciao, District of Leira, Estremadura Province. American Institute of Mining Engineers, 1886. 37895.

—— Dull red; very fine and compact. From the quarries of Manoel Zuarte, Lagarteira, Anciao, District of Leiria, Estremadura Province. American Institute of Mining Engineers, 1886. 37894.

Limestone [marble]. Red mottled; fossiliferous. 10½ by 10½ by 1 inches. Locality, etc., same as above. 37909.

—— Dark blue gray; fine and compact. 5 by 5 by 1 inches. Quarries at Cintra, District of Lisbon, Estremadura Province. Centennial, 1876. 27677.

—— Yellowish gray; crystalline. 5 by 5 by 1 inches. Quarries at Cintra, District of Lisbon, Estremadura Province. Centennial 1876. 27674.

—— Gray; fine and compact. 5 by 5 by 1 inches. Locality, etc., same as above. 27675.

—— Coarse; gray; crystaline. 5 by 5 by 1 inches. Locality, etc., same as above. 27676.

—— Light and dark gray, mottled; fine and compact. 4½ by 5½ by 1 inches. Locality, etc., same as above. 27678.

—— Coarsely crystalline; white. 4½ by 5½ by 1 inches. Locality, etc., same as above. 27679.

—— Black; very fine and compact. 10½ by 10½ by 1 inches. Locality, etc., same as above. 27672.

—— Yellow; fine and compact. 10 by 10 by 1 inches. From quarries at Cintra, District of Lisbon. American Institute of Mining Engineers, 1886. 37910.

—— Lisbon, Portugal. American Institute Mining Engineers, 1886. 37841.

—— White; crystalline. 5 by 5 by 1 inches. From the Penha Longa quarries. Cruz dos Quarto Carminhos, Cintra, District of Lisbon, Estremadura Province. American Institute of Mining Engineers, 1886. 37888.

—— Dark gray; fine and compact. Locality, etc., same as above. 37889.

—— Dark blue-gray and white; crystalline. 4 by 6 by 1 inches. Las Gonçala. Locality, etc., otherwise as above. 37890.

—— Yellowish; coarsely fossiliferous. 10½ by 10½ by 3½ inches. From quarries at Tojal, Estremadura Province. Portuguese Centennial Commission, 1876. 27670.

—— White; coarsely crystalline. 8 by 8 by 1 inches. Portuguese Centennial Commission, 1876. 27722.

Shell limestone. Coarse, cellular. Locality, etc., same as above. 27794.

—— Fine; light colored. Locality, etc., same as above. 27800.

—— Fine; light colored. Locality, etc., same as above. 27801.

Bituminous limestone. Very light brown. Locality, etc., same as above. 27759.

Calcarious conglomerate. Coarse; reddish. Locality, etc., same as above. 27760.

Calcarious conglomerate [marble]. Coarse; reddish; variegated. 8 by 6 by 1 inches. From quarries in the Arrabida Mountains, District of Lisbon, Estremadura Province. Portuguese Centennial Commission, 1876. 27717.

—— Marble. Coarse; red; variegated. 9½ by 7½ by ¾ inches. Locality, etc., same as above. 27718.

—— Marble. Coarse; pink and yellow variegated. 8 by 6 by 1 inches. Locality, etc., same as above. 27719.

Dolomite. Compact; finely cellular; dark drab. Used for making quicklime From quarries near San Miguel in the mountain of Poiares, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27752.

Sandstone. Fine; red. Penella, Beira Province. 27761.

—— Ferruginous; fine; red. Locality, etc., same as above. 27767.

—— Fine; gray. From quarries at San Miguel, District of Leiria, Estremadura Province. American Institute of Mining Engineers, 1886. 37898.

—— Fine; very light brown. From quarries at Pombal, District of Leiria, Estremadura Province. American Institute of Mining Engineers, 1886. 37896.

Calcareous sandstone. Coarse; light colored. Penella, Beira Province. 27817.

Calcareous sandstone. Gray; compact. From quarries at Lapa, District of Leiria, Estremadura Province. American Institute of Mining Engineers, 1886. 37897.

Mica granite. Fine; reddish. From quarries at Gramacos, Oliveira do Hospital, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27818.

—— Coarse; gray. From quarries at Santa Ovaia, Oliveira do Hospital, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27819.

—— Gray; coarse; porphyritic. From quarries at Pedreirada S6, Taboa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27820.

—— Fine; light gray. Portuguese Centennial Commission, 1876. 27775.

Slate. Coarse blue-gray. From quarries at Espariz, Taboa, District of Coimbra, Beira Province. Portuguese Centennial Commission, 1876. 27756.

Granite. Coarse; gray. 5 by 5 by 1 inches. Cintra, Estremadura Province. American Institute of Mining Engineers, 1886. 37893.

Marble. Pink; fine and compact. Lisbon. Portuguese Centennial Commission, 1876. 26450.

Dolomite [marble]. White; crystalline. 5 by 5 by 1 inches. Terra do Tanque. Estremadura Province. 37891.

—— White; crystalline. 4 by 5 by ½ inches. Locality, etc., same as last. 37892.

Limestone (stalagmatic). Brown mottled; irregular oval mass, about 17 by 8 by 4 inches. Rock of Gibraltar. Centennial Commission, 1876. 25027.

Stalagmite [marble]. Brown. Small slab, 3 by 4 inches. Rock of Gibraltar. A. R. Crittenden, 1886. 38444.

Hornblende andesite (?). Fine dark gray, nearly black, with small white spots. This stone is used in hewn and rubble work in localities where there is no other. It is very easy to cut in blocks of any size. 5-inch cube. From quarries near Ponta Delgada, on the Island of São Miguel, Azores. Portuguese Centennial Commission, 1876. 37904.

Basalt. Coarsely vesicular; dark gray, almost black in color. Used for hewn stone of inferior quality to remain in sight in buildings of a superior construction. Also used as an imitation of hewn stone when covered with cement, which adheres very well to the asperities of the stone, and as hewn and rubble stones in inferior constructions. Locality, etc., as above. 37905.

—— Dark gray; fine and compact; somewhat vesicular. This stone is very hard and difficult to hew, and on this account is used only for rubble work and as loose stone in breakwaters. Locality, etc., as above. 37906.

—— Dark gray, nearly black; very vesicular. Used as a second-rate stone in the commonest kind of hewn work. Locality, etc., as above. 37907.

—— Fine and compact; dark gray. A first-class stone, used in hewn work in buildings of superior construction. Locality, etc., as above. 37908.

—— Red; ferruginous; coarsely vesicular. Santa Cruz de Teneriffe, Canary Islands. Portuguese Centennial Commission, 1876. 27712.

Pozzuolana. Volcanic clay; employed with great success to give, when mixed with lime not hydraulic or slightly hydraulic, the properties which the latter requires for composing hydraulic mortars. Very abundant in St. Michaels, and explored in great scale in the suburbs of Ponta Delgada for the buildings of the locality and for exportation to the continent of Portugal. It is generally employed in all the public works of the country. In constructions out of water, or in hydraulic works by tides or in fresh water, the masonry is made with mortar composed of one part of lime and three parts of pozzuolana, using lime not hydraulic for the first kind of works and slightly hydraulic for the second. For works constantly exposed to the sea slightly hydraulic lime, pozzuolana, and coarse sand are mixed together in equal parts. (Portuguese Centennial Catalogue, p. 95). Locality, etc., as above. 35527.

Artificial stone, formed by mixing pozzuolana with lime as described above. Locality, etc., same as last. 35527.

Volcanic tuff. Dark gray. Grand Canary Islands. Portuguese Centennial Commission, 1876. 27710.

—— Coarse; dull red. Grand Canary Islands. Portuguese Centennial Commission, 1876. 27713.

SPAIN.

Calcareous breccia [marble]. Coarse; drab and light brown. From quarries in Saragossa Province. Spanish Centennial Commission, 1876. 27694.

—— A coarse breccia, made up of fragments of nearly black limestone embedded in a brown ground mass. From quarries at Chodes, Saragossa Province. Spanish Centennial Commission, 1876. 27692.

—— Like the last, but more compact. Locality, etc., the same. 27693.

—— Coarse; dull, with white veins. Locality, etc., same as above. 27698.

—— Made up of fragments of nearly black limestone embeded in a white crystalline ground mass. From quarries at Ricla, Saragossa Province. Spanish Centennial Commission, 1876. 27696.

—— Coarse; composed of fragments of dark and ferruginous limestone cemented by white crystalline carbonate of lime. From quarries at Morata, Saragossa Province. Spanish Centennial Commission, 1876. 27714.

—— Dull red and white; cellular. From quarries at Puebla de Alborton, Saragossa Province. Spanish Centennial Commission, 1876. 27688.

Limestone [marble]. Very light drab, with fine pink veins; fine and compact. From quarries in Saragossa Province. Spanish Centennial Commission, 1876. 27695.

—— Coarse; yellowish. Locality, etc., same as above. 27697.

—— Very dark drab, with white and red veins; fine and compact. Locality, etc., same as above. 27690.

—— Dull red; fine and compact. From quarries at Ricla, Saragossa Province. Spanish Centennial Commission, 1876. 27684.

—— Gray; crystalline. 6 by 6 by 1 inches. Murcia, Murcia Province. Spanish Centennial Commission, 1876. 27774.

—— Red and yellow mottled; fine and compact. 6 by 6 by 1 inches. Cehegin, Murcia Province. Spanish Centennial Commission, 1876. 27706.

—— Dark blue-gray and white mottled; crystalline. 5 by 5 by 1 inches. Almazarron, Murcia Province. Spanish Centennial Commission, 1876. 27707.

—— Dark blue-gray; crystalline. Panticosa, Huesca Province. Spanish Centennial Commission, 1876. 27683.

—— Nearly black with whitish veins; very fine and compact. 5 by 5 by 1 inches. Callosa de Ensarria, Alicante Province. Spanish Centennial Commission, 1876. 27711.

—— Dark yellow; compact. 8 by 8 by 1½ inches. Nueva Esparta. 36998.

Limestone. Bluish drab; fine and compact. From quarries in Saragossa Province. Spanish Centennial Commission. 27700.

—— Drab. Locality, etc., same as above. 27821.

—— Deep blue-black; very fine and compact. From quarries at Ricla, Saragossa Province. Spanish Centennial Commission, 1876. 27763.

—— Dark gray; compact. Puebla de Alborton, Saragossa Province. Spanish Centennial Commission, 1876. 27689.

—— Pinkish; fine and compact. Locality, etc., same as above. 27765.

Limestone. Nearly white; coarse; cellular. From quarries at Calatayud, Saragossa Province. Spanish Centennial Commisson, 1876. 27686.

—— Dark gray; compact. Locality, etc., same as above. 27691.

—— White; semi-crystalline. From quarries at Alhama, Saragossa Province. Spanish Centennial Commission, 1876. 27764.

—— Compact; dark gray. 6-inch cube. Murcia, Murcia Province. Spanish Centennial Commission, 1876. 27773.

—— Chalk. From quarries at Calatayud, Saragossa Province. Spanish Centennial Commission, 1876. 27685.

Gypsum. Compact; gray. From quarries at Ricla, Saragossa Province. Spanish Centennial Commission, 1876. 27768.

—— Compact; dark gray. Locality, etc., same as above. 27687.

—— Alabaster; pure white; translucent. Locality, etc., same as above. 27699.

—— Alabaster; white. From quarries at Saragossa, Saragossa Province. Spanish Centennial Commission, 1876. 27701.

—— Alabaster; pure white; translucent. 7½ by 7½ by 1 inches. From quarries in the province of Guadalajara. American Institute Mining Engineers, 1886. 34535.

—— Compact; blue-gray and yellowish gray, mottled. From Murcia, Murcia Province. Spanish Centennial Commission, 1886. 27705.

Shell limestone. Coarse; light buff. Murcia, Murcia Province. Spanish Centennial Commission, 1876. 27703.

—— Coarse and friable; light colored. Locality, etc., same as above. 27772.

—— Fine; light colored; cellular. Murcia, Murcia Province. Centennial, 1876. 27771.

Calcareous sandstone. Very light brown; fine; cellular. Locality, etc., as above. 27716.

—— Light colored. Locality, etc., same as above. 27769.

—— Fine; light yellow. 6-inch cube. Murcia, Murcia Province. Spanish Centennial Commission, 1876. 27776.

—— Light pinkish; cellular. 5-inch cube. Santa Maria, Oveido Province. Spanish Centennial Commission, 1876. 27715.

Dolomite. Coarse; drab. Spanish Centennial Commission, 1876. 27777.

Calcareous tufa. Yellowish; compact but cellular. 6-inch cube. Locality, etc., as above. 27704.

Sandstone. Green; colored by copper oxide. San Romando Morrano, Huesca Province. Spanish Centennial Commission, 1876. 27702.

Slate. Blue-black. 25083.

(7) Africa.

Algeria.

Marble. "Jaune antique doré." Yellow and yellow pink-spotted. Two specimens. Slab 12 by 12 by ¾ inches. Western Algeria, E. Fritsch, New York, 1886. 38440.

—— "Paonazzo rosso." Dull red. Slab 12 by 12 by ¾ inches. Western Algeria. E. Fritsch, New York, 1886. 38441.

—— "Jaune chiaro ondaté." Yellowish; red veined. Slab 12 by 12 by ¾ inches. Western Algeria. E. Fritsch, New York., 1886. 38442.

—— "Jaune rosé." Yellowish; red veined. Slab 12 by 12 by ¾ inches. Western Algeria. E. Fritsch, New York, 1886. 38443.

—— "Rose clare." Light-rose tinted. Slab 12 by 12 by 1 inches. Western Algeria. E. Fritsch, New York, 1887. 38839.

Marble. "Jaspe rouge." A jasper red breccia, with light spots and streaks. Slab 12 by 12 by 1 inches. Western Algeria. Gift of E. Fritsch, New York. 38841.

—— "Breche sanguiné." Blood-red, light and dark. Western Algeria. Gift of E. Fritsch, New York. 38840.

EGYPT.

Onyx marble. From quarries at Blad Recam, near ravine of Oned-Abdallah, Egypt (?). Polished block, 8¼ by 7 by 7 inches. 25343.

This stone, the so-called Egyptian onyx, is composed principally of carbonate of lime, and occurs in large beds among the Tertiary limestones of Blad Recam (marble country), near the ravine of Oned-Abdallah. The old quarries which supplied the inhabitants of Rome and Carthage with the fine translucent marble used in the interior decorations of their houses and monuments were here situated. These quarries were for over 1,000 years entirely lost sight of, and it was not until the year 1849 that they were rediscovered by a French gentleman, M. Delmonte. In ancient times the stone was cut into small vases for holding precious ointments. It is now imported in considerable quantities into Paris, where it is used in the manufacture of time-pieces, small vases, candlesticks, and similar objects. (On Building and Ornamental Stones, by E. Hull, p. 149.)

Onyx marble. From quarries at Blad Recam, near ravine of Oned-Abdallah, Egypt (?). Polished block, 18 by 8¼ by 7 inches.

This stone, popularly called Oriental alabaster, is another variety of marble derived from quarries in Egypt, and employed in works of art, except statuary, both in ancient and mediæval times. Its stalagmitic origin is at once apparent upon inspection. The color is that of amber, or rich yellowish brown, of various shades arranged in folds or wavy parallel bands; sometimes it is beautifully iridescent. The mammillated structure so characteristic of deposits due to filtration or percolation is also not infrequent. This stone was largely employed by the ancient inhabitants of Egypt in the formation of canopi (or jars surmounted by sculptured images of the dog-headed god), in which were deposited the ashes of the dead. Besides these smaller objects, large cinerary urns were formed of this material. This stone is popularly called alabaster, but is entirely different from true alabaster in composition. (On Building and Ornamental Stones, by E. Hull, p. 150. See text, p. 475.)

Travertine. "Orientalal alabaster." Yellowish and nearly colorless. Two specimens. 4 by 4 by ½ and 4 by 2 by ½ inches. Bowker, Torrey & Co., Boston, 1884. 36774.

Porphyrite. Egyptian porphyry or "rosso antico." Very dark red, with pink porphyritic feldspars. 2½ by 2 by ½ inches. From quarries near the first cataract of the Nile. 4863.

Nummulitic limestone. A portion of one of the steps formerly leading to the obelisk at Alexandria, Egypt, now in Central Park, New York. Alexandria. Commander H. H. Gorringe, U. S. Navy, 1881. 26816.

Granite. A block of red hornblende biotite granite found in the débris at the foot of the Egyptian obelisk at Alexandria by Commander Gorringe during the excavations preparatory to its removal to New York. That the fragment was originally a portion of one of the obelisks now in New York and London is undoubted, though of which can not with certainty be told. The specimen still shows the original carving. Syene. Commander H. H. Gorringe, U. S. Navy, 1881. 26815.

—— A block of blue-gray hornblende mica granite, being a portion of a large column found in the débris at Alexandria during the excavations preparatory to the removal of the obelisk to New York. The locality from whence the rock was originally taken is not known. Alexandria. Commander H. H. Gorringe, 1881. 26817.

(8) Asia.

TURKEY.

Marble. Pink. Seitan, Isle of Samos. 9 by 11 by 1 inches. Turkish Centennial Commission, 1876. 27086.

CHINA.

Granite. Light gray. Circular disk, about 5 inches in diameter and 1 inch thick. Hong-Kong. John Long, 1883. 28576.

Rhyolite. Compact; light brown. Suburbs of Ningpo. 8 by 4 by 2 inches. Chinese. Centennial Commission, 1876. 38580.

Tuff. Compact; light brown. Two specimens, 8 by 4 by 2 inches. Locality, etc., same as above. 38581.

—— Compact; light greenish. Two specimens, 8 by 4 by 2 inches. Locality, etc., same as above. 38582.

COREA.

Mottled yellow stone. Box made of. J. B. Bernadou, ensign U. S. Navy, 1886. 38327.

Yellow and green marble [Serpentine]. Stone pencil jar of. J. B. Bernadou, 1886. 38328.

Yellow marble. Disk of. J. B. Bernadou, 1886. 38329.

Ophiolite. White and green mottled. Slab 10 by 20 inches. J. B. Bernadou, 1886. 38330.

JAPAN.

Steatite (?). Massive; compact; dark greenish gray. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27552.

—— Massive; dark green, nearly black. 5½ by 5½ by 1 inches. Hitachi. Centennial, 1876. 27553.

—— Massive; compact; dark green, nearly black. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27554.

—— Massive; compact; dark greenish gray. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27534.

—— Massive; compact; dark green, nearly black, with white spots. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27535.

—— Massive; compact; dark green and gray mottled. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27560.

—— Massive; compact; dark green, nearly black. 11 by 6¾ by 2½ inches. Hizen. Centennial, 1876. 27561.

—— Massive; compact; dark green, nearly black. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27555.

—— Massive; compact; dark green, nearly black. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27557.

—— Massive; compact; dark greenish gray. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27559.

—— Massive; compact; dark green and gray. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27540.

—— Massive; dark greenish gray. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27550.

—— Massive; dark green, nearly black. 6 by 6 by 1 inches. Tagagori, Hitachi. Centennial, 1876. 27551.

Marble. White. 3¾ by 3½ by ½ inches. Mino Province. Centennial, 1876. 27137.

—— Pink, black, and white, brecciated. 3¾ by 3¾ by ½ inches. Mino Province. Centennial, 1876. 27138.

—— Black, with white fossils. 3¾ by 3½ by ½ inches. Mino Province. Centennial, 1876. 27139.

—— Black and white; breccia. 3¾ by 3¾ by ½ inches. Mino Province. Centennial, 1876. 27140.

—— Dark gray, black spotted. 3¾ by 3½ by ½ inches. Mino Province. Centennial, 1876. 27141.

—— White, green veined. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27536.

—— White; crystalline. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27538.

—— White, with blue-gray veins; resembles the Italian bardiglio. 6 by 6 by 1 inches. Two specimens. Hitachi. Centennial, 1876. 27539.

—— White, green veined. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27542.

—— White, green veined. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27541.

—— White, green veined. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27543.

—— White, with blue-gray veins; resembles the Italian bardiglio. Two specimens. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27544.

—— White, green veined. 6 by 6 by 1 inches. Hitachi. Centennial, 1876. 27545.

—— White; crystalline. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27546.

—— White; crystalline. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27547.

—— White, green veined. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27558.

—— White; crystalline. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27548.

—— White; crystalline. 6½ by 6½ by 1 inches. Hitachi. Centennial, 1876. 27549.

RUSSIA.

Quartz porphyry. Dull red base, with large porphyritic feldspars and quartzes. 2½ by 2½ inches. Isle Hoghland. Russian Centennial Commission, 1876. 27582.

—— A compact purplish base, carrying porphyritic yellowish and reddish feldspars. 3 by 4 inches. Nishne-Issetsk Works, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27565.

—— (Porphyry.) A compact purplish rock, with very many white porphyritic feldspars and glassy quartz. 4 by 5 inches. Isle Hoghland. Russian Centennial Commission, 1876. 27580.

—— (Porphyry.) Red base, with large reddish feldspars and glassy quartzes. 2½ by 3 inches. Isle Hoghland. Russian Centennial Commission, 1876. 27581.

—— (Keratitic porphyry.) Very fine and compact; nearly black, with small porphyritic feldspars and quartzes, arranged in nearly parallel indistinct bands. 3½ by 4 inches. Lake Narori, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27568.

—— (Keratitic porphyry.) Dark gray, nearly black, with abundant porphyritic whitish feldspars and quartzes. Irregular fragment, 2 by 3 inches. River Tchervenka, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27566.

Porphyry conglomerate. (Keratitic porphyry.) A greenish-black conglomerate, composed of felsitic (?) fragments very closely compacted by a siliceous paste. 3 by 4 inches. Redoubt Kolpatsk, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27567.

Porphyry breccia. (Keratitic porphyry.) A red, compact breccia, composed of porphyry particles. 4 by 4 inches. Redoubt Kolpatsk, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27570.

Diorite porphyry. A compact, greenish rock, with irregular yellowish blotches. 3 by 4 inches. District of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27571.

—— A compact felsitic rock, consisting of a deep purplish base, streaked and spotted with irregular white and brownish spots. 4 by 2½ inches. Village Sidelnikowa, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27572.

—— Compact; green, with small porphyritic feldspars. 3½ by 4 inches. River Konda, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27573.

Diorite. Very fine-grained and compact green, with yellowish flecks and streaks. 3 by 4½ inches. Beresovsk mines, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27574.

—— Very compact; nearly black, with grayish streaks. 3 by 4 inches. Fort Sanarskaia, district of Katharinenburg, Ural. Russian Centennial Commission. 1876. 27575.

Jasper. Compact; dull red. 3 by 4 inches. Neviansk Works, district of Katharinenburg, Ural. Russian Centennial Commission, 1876. 27578.

(9) Australia.

Marble. White. 9 by 9 by 1 inches. New South Wales. Centennial, 1876. 19500.

—— White, yellow veins. 9 by 9 by 1 inches. New South Wales. Centennial, 1876. 19501.

—— Dark gray, nearly black. 9 by 9 by 1 inches. New South Wales. Centennial, 1876. 19502.

—— Blue-gray mottled. 9 by 9 by 1 inches. New South Wales. Centennial, 1876. 19504.

—— Gray. 8-inch cube. Centennial, 1876. 25215.

—— White. 11½ by 12 by 4 inches. New South Wales. Centennial, 1876. 25201.

—— Gray. About 12 by 12 by 4 inches. New South Wales. Centennial, 1876. 25210.

—— White. 12 by 12 by 4 inches. New South Wales. Centennial, 1876. 25211.

—— Black. 12 by 12 by 4½ inches. New South Wales. Centennial, 1876. 25212.

—— Gray and yellow mottled, 12-inch cube. New South Wales. Centennial, 1876. 25092.

—— Light mottled. 8½-inch cube. Centennial, 1876. 25216.

—— Gray. 9-inch cube. Centennial, 1876. 26022.

—— Gray mottled. 8½-inch cube. Centennial, 1876. 26024.

Sandstone. Light colored; medium. 12-inch cube. New South Wales. Centennial, 1876. 25202.

—— Light colored; medium. 12-inch cube. New South Wales. Centennial, 1876. 25203.

—— Light colored; medium. 12-inch cube. New South Wales. Centennial, 1876. 25214.

Hornblende biotite granite. Coarse; gray. 12-inch cube. New South Wales. Centennial, 1876. 25213.

(10) Hawaiian Islands.

Limestone. Light colored; cellular. 12-inch cube. Island of Oahu. Waine quarry. Boston Foreign Exhibition, 1884. 35540.

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LIST OF SPECIMENS OF TEXTILE FIBERS AND FABRICS IN THE REFERENCE SERIES OF THE SECTION OF TEXTILE INDUSTRIES OF THE U. S. NATIONAL MUSEUM, JUNE 30, 1886.

By Romyn Hitchcock.

7011. *Abutilon avicennæ*, Missouri.
7008. *Abutilon Bedfordianum*, Australia.
7009. *Abutilon mollis*, Australia.
7010. *Abutilon oxycarpum*, Australia.
7112. *Acer cratoegifolium*, Urina no kawa.
6881. *Acrocomia sclerocarpa*, Coco de catarrho, Brazil.
6998. *Adam's Needle, Yucca aloifolia*, Australia.
7027. African hemp.
15338. *Agave* sp. Costa Rica Indians, District of Talamanca.
5327. 7842. *Agave Americana.*
6970. *Agave Americana*, Nicaragua.
21070. *Agave deserti*, Southern California.
5335. 7977. *Agave keratto*, Jamaica.
7940. *Agave lechuguilla*, Mexico.
7115. Aiso, *Urtica Thunbergiana.*
7456. Algodon sylvestris (down), Yughan, Argentine Republic.
Aloe, American. (See *Agave.*)
7154. Alpaca wool.
7502. *Ampelodesma tenax*, Diss, Genoa.
7022. *Ananassa sativa*, pineapple.
5133. *Ananassa sativa*, pineapple, China.
5338. 7972. *Ananassa sativa*, pineapple, Jamaica.
7819. 7820. 7821. Angora wool, Argentine Republic.
7560. Angora wool (fabric), Kentucky.
7330. Angora wool, Maryland.
5315. Anono colorado (bark), San Francisco.
7555. *Anthercæ mylitta* (cocoons), Tusser silk, India.
7025. *Apocynum* sp. (fiber), Minnesota.
7024. *Apocynum* sp. (rope), Utah.
7078. *Arum peniculaceum.*
7001. *Asclepias* (fiber), United States.
7003. *Asclepias* (fiber), Cipo lactecente, Brazil.
7338. *Asclepias* (fiber) milkweed, Iowa.
6999. *Asclepias* (down), Tripoli.
6560. *Asclepias* (down), vegetable silk, India.
7000. *Asclepias* (stalk and fiber), United States.
7002. *Asclepias* and cotton (fabric).
7487. *Asclepias cornuti*, New Jersey.
6875. 6873. *Astrocaryum vulgare*, tucum, Brazil.
7565. Bagasse, sugar cane, New Orleans.
7015. 7016. Banana, *Musa sapientum.*
5341. 7974. Banana, *Musa sapientum*, Jamaica.
7337. Banana and silk (fabric).
5021. Bark, used for cords, Pai Ute Indians.
5001. Bark used for ropes, San Domingo.
5188. *Betula Bhojpattra* (bark), East Indies.
7082. 7083. 7084. 7116. *Bœhmeria nivea*, China grass.
7630. 7131. 7632. *Bœhmeria nivea*, France.

7979. *Bœhmeria nivea*, Jamaica.
7081. *Bœhmeria nivea*, Mexico.
7080. *Bœhmeria nivea*, Mississippi.
7093. 7095. *Bœhmeria nivea*, Philadelphia.
7639. *Bœhmeria nivea* (fabrics), France.
7096. *Bœhmeria nivea* with wool, cotton, etc. (fabrics).
7990. *Bombax ceiba* (bark), flor ceiba, Venezuela.
5263. *Bombax ceiba*, pochote, Guatemala.
6864. *Bombax globosa*, paina de coco, Brazil.
7457. *Bombax pendandrum*, pohate, Yucatan.
7007. Bottle tree, *Sterculia rupestris*, Australia.
7976. Bowstring hemp, *Sanseviera zeylanica*, Jamaica.
5337. 7970. Bowstring hemp, African, *Sanseviera guineensis*, Jamaica.
5015. *Bromelia* sp., District of Canara.
7020. *Bromelia* sp., Southern Florida.
5340. *Bromelia karatas*, silk grass, Jamaica.
5339. 7975. *Bromelia pinguin*, pinguin, Jamaica.
7625. Bulrush, great, *Scirpus validus*, Arizona.
7980. Burn-nose bark, *Daphnopsis tinifolia*, Jamaica.
7579. Cactus fiber, Argentine Republic.
7824. 7825. 7826. 7827. Calf hair, Germany
7156. Camel's hair.
8053. Camel's hair, Russia.
7567. Canna plant, New Orleans.
7285. *Cannabis sativa*, hemp, Argentine Republic.
5325. *Cannabis sativa* (seed), hemp, Persia.
7290. *Cannabis sativa*, hemp, Portugal.
7291. *Cannabis sativa*, hemp, second class, Portugal.
7292. *Cannabis sativa*, hemp, third class, Portugal.
5036. *Cannabis sativa*, hemp, Spain.
7981. *Carludovica plumieri*, low palmetto, Jamaica.
7499. *Caryota urens*, kittool, Ceylon.
7813. Cashmere wool, Alabama.
7407. Cashmere wool, California.
5345. *Cecropia peltata* (bark), trumpet-tree, Jamaica.
23350. Cedar bark (dressed), Neah Bay, Washington Territory.
88732. Cedar root splints, Massett Indians, British Columbia.
7589. *Chamærops excelsa*, China.
6869. *Chorisia speciosa*, paina branca, Brazil.
China grass. (See *Bœhmeria*.)
7269. *Cibotium* sp., pulu, Sandwich Islands.
7988. Cibucaia de buchivacoa, Venezuela.
7616. Cipo. (See Sipo.)
7003. Cipo lactecente, *Asclepias*, Brazil.
7978. *Cladium occidentale*, rush or flag grass, Jamaica.
6881. Coco de catarrho, *Acrocomia sclerocarpa*, Brazil.
7570. Cocoa-nut, *Cocos nucifera*.
7570. *Cocos nucifera*, cocoa-nut.
7570. Coir. (See Cocoa-nut.)
7138. *Corchorus* sp., jute, France.
7120. 7121. 7128. 6976. *Corchorus* sp., jute, Louisiana.
7122. *Corchorus* sp., jute, Virginia.
7488. *Corchorus* sp., prepared jute and paper pulp, New Jersey.
7111. *Corchorus capsularis*.
7034. *Corchorus capsularis*, jute, Asia.
7136. *Corchorus capsularis*, jute, Maryland.
7037. *Corchorus capsularis*, jute, New Orleans.
7039. *Corchorus capsularis*, jute, Southwestern United States.
7030. *Corchorus olitorius*, Australia.
7131. *Cordia jerascanthus*.
7497. *Cordia grandis* (bark), Cuddapah.
7263. *Cordyline indivisa*, tall palm lily, Australia.
7288. *Cordyline pumilio*, dwarf palm lily, New Zealand.
7588. Corn fiber (paper), Austria.
7408. 7409. 7410. 7590. Cosmos (fibers and fabrics).
7402. Cotton bolls.
7542. Cotton, Hiwaiian Islands.
7552. Cotton, San Paulo.
6899. Cotton, Madagascar.
7960. Cotton, Mexico.
7533. Cotton tree.
57490. Cotton, yellow, China.
7002. Cotton and asclepias (fabric).

7642. Cotton cloth (red), Malta.
7332. Cotton, flax, and wool (fabric).
7312. Cotton, wool, and ramie (fabric).
7568. Cotton stalk (bark and fiber).
7564. Cotton stalk (fiber), New Orleans.
5028. Cotton yarns (colored with Mysore dyes), India.
5054. Cypress, swamp (inner bark), Quapaw Indians.
5343. 6760. 7973. Dagger plant, *Yucca aloifolia*, Jamaica.
7506. *Daphne cannabina*, Kamoon (paper).
7267. *Daphne tenuifolia.*
7980. *Daphnopsis tinifolia*, burn-nose bark, Jamaica.
7504. *Debregeasia longifolia*, Wild Rhea, India.
7494. *Dipterocarpus tuberculatus*, Burmah.
7502. Diss, *Ampelodesma tenax*, Genoa.
7286. *Doryanthus excelsa*, Spear Lily, Australia.
Down. (See *Algodon sylvestris*, *Asclepias*, *Bombax*, Paina, *Populus*, *Ochroma lagopus*, etc.)
7288. Dwarf Palm Lily, *Cordyline pumilio*, New Zealand.
7954. *Echinocactus horizonthalmum*, wild silk, Mexico.
6884. Embirama *Xylopia sericea*, Brazil.
7261. *Epeira socialis*, silk spun by spiders, Argentine Republic.
6865. 6872. *Eriodendron* sp. Paina loura, Brazil.
7287. *Eucalyptus obliqua*, stringy bark, Australia.
7042. Fibers (unknown), Swan River, United States of Colombia.
7496. *Ficus tsiela*, India.
7004. Flame tree, *Sterculia acerifolia*, Australia.
7293. Flax, *Linum usitatissimum*, Brazil.
6937. Flax, *Linum usitatissimum*, sixty-two specimens from various countries.
6934. Flax, cottonized (unbleached).
6935. Flax, cottonized (bleached).
7574. Flax (dressed).
7283. Flax, Irish (water-retted).
5140. Flax, *Linum usitatissimum*, Spain.
7998. 7999. Flax, *Linum usitatissimum*, Russia.
6939. Flax, New Zealand, *Phormium tenax*, New Zealand.
7332. Flax, wool, and cotton (fabric).
7906. Flax fabric (ancient).
7990. Flor ceiba (bark) *Bombax ceiba*, Venezuela.
7971. *Furcræa Cubensis*, Henequen or silk grass, Jamaica.
5047. *Furcræa gigantea*, Madras.
7026. *Furcræa gigantea*, Mexican hemp, Australia.
7130. *Gazona ulmifolia.*
57495. 57496. Goat hair, China.
7564. 7568. *Gossypium* sp. (stalk and fiber), New Orleans.
5207. Grass (whisk broom), Florence.
7153. Guanaco wool.
6860. 6861. 6862. Guaxima, *Urena lobata*, Brazil.
6863. Guaxima (seeds), *Urena lobata*, Brazil.
7156. Hair, camel.
8053. Hair, camel, Russia.
57495. 57496. Hair, goat, China.
7109. *Helicteres jamaicensis.*
Hemp. (See *Cannabis sativa.*)
7027. Hemp, African.
5337. 7970. Hemp, African bowstring, *Sanseviera guineensis*, Jamaica.
7976. Hemp, bowstring, *Sanseviera zeylanica*, Jamaica.
7026. Hemp, Mexican, *Furcræa gigantea* Australia.
7028. 7031. Hemp, Queensland, *Sida retusa*, Australia.
7289. Hemp, Victorian, *Plagianthus pulchellus*, Australia.
5127. Hemp, coarse, *Sida tiliæfolia*, Kingma, China.
5016. Hemp bark, Pau, Siam.
7672. 7679. Hemp cloth, Madagascar.
7850. Henequen, Mexico.
7971. Henequen or silk grass, *Furcræa cubensis*, Jamaica.
6979. *Hibiscus* sp.
6987. *Hibiscus esculentus.*
6981. *Hibiscus esculentus*, Maryland.
6980. *Hibiscus esculentus*, Mississippi.
6982. *Hibiscus latifolia.*
7035. *Hibiscus moscheutos*, American jute, United States.
7284. *Hibiscus moscheutos*, Ohio.
6978. *Hibiscus sabdariffa.*
6977. *Hibiscus sinensis.*

7119. *Hibiscus syriacus*, Makuki.
5211. *Hibisus tiliaceus*, China.
7495. *Holoptelia integrifolia*, Madras.
12261. Indian fabrics, Ohio.
7934. Istle (ixtle) (fiber and coraline).
7872. Istle de lechuguilla, Mexico.
Jute. (See *Corchorus* sp.)
7034. Jute, *Corchorus capsularis*, Asia.
7036. Jute, *Corchorus capsularis*, Maryland.
7037. Jute, *Corchorus capsularis*, New Orleans.
7039. Jute, *Corchorus capsularis*, southwestern United States.
7030. Jute, *Corchorus olitorius*, Australia.
7035. Jute, American, *Hibiscus moscheutos*, United States.
7489. Jute and paper pulp.
7506. Kamoon (paper), *Daphne cannabina*.
7117. Kanabikio.
7111. Kanabikio, *Corchorus capsularis*.
7116. Kara mushi, *Bœhmeria nivea*.
5335. 7977. Keratto, *Agave keratto*, Jamaica.
5127. King-ma (coarse hemp), *Sida tiliæfolia*, China.
7499. Kittool, *Caryota urens*, Ceylon.
7076. *Kleinhovia hospita*.
7077. *Kydia calycina*.
7507. *Kydia calycina*, Australia.
7295. *Laportea gigas*, Tree-nettle, Australia.
7872. Lechuguilla (ixtle or istle), Mexico.
7873. Lechuguilla yunguillo, Mexico.
7874. Lechuguilla zarcia, Mexico.
7264. *Lepedospermum flexuosum*, sword-rush, Australia.
7288. Lily, dwarf palm, *Cordyline pumilio*, New Zealand.
7263. Lily, tall palm, *Cordyline indivisa*, Australia.
7286. Lily, spear, *Doryanthus excelsa*, Australia.
7152. Lana de Lina (wool), cross between sheep and goat, Argentine Republic.
7612. Linho, Brazil.
7293. *Linum usitatissimum*. (See Flax.)
7266. *Lyonsia reticulata*, Australia.
7141. Maize (husk, yarn, and cloth).
5177. Majaguillo bark, Venezuela.
7119. Makuki, *Hibiscus syriacus*.
7017. Manilla hemp, *Musa textilis*.
7044. *Mauritia flexuosa*, Uta palm, Demerara.
107534. Mescal fiber, Arizona.
7338. Milkweed, *Asclepias*, Iowa.
7118. Mitsumata, *Wikstræmia Japonica*.
7586. Mohair (combed).
8054. Mummy cloth.
7013. *Musa paradisiaca*, plantain.
7014. *Musa paradisiaca*, plantain hemp, Australia.
7023. *Musa paradisiaca*, plantain, British Guiana.
7012. *Musa paradisiaca*, plantain, Demerara.
7015. 7016. *Musa sapientum*, banana.
5341. 7974. *Musa sapientum*, banana, Jamaica.
7017. *Musa textilis*, manilla hemp.
7295. Nettle-tree, *Laportea gigas*, Australia.
7453. *Ochroma lagopus* (down), Venezuela.
7043. *Ochroma lagopus* (bark), West Indies.
6869. Paina branca, *Chorisia speciosa*, Brazil.
6864. Paina de coco, *Bombax globosa*, Brazil.
6865. 6872. Paina loura, *Eriodendron* sp., Brazil.
6880. Paina loura (seeds), *Eriodendron* sp., Brazil.
7288. Palm Lily, dwarf, *Cordyline pumilio*, New Zealand.
7263. Palm Lily, tall, *Cordyline indivisa*, Australia.
7573. Palmetto, Sabal palmetto, Georgia.
7981. Palmetto, low, *Carludovica plumieri*, Jamaica.
5332. Papelillo fiber, San Salvador.
5016. Pau, hemp bark, Siam.
7503. *Phœnix pedunculata*, Madras.
6939. *Phorium tenax*, New Zealand flax, New Zealand.
Pine-apple. (See *Ananassa* and *Bromelia*.)
7975. Pinguin, *Bromelia pinguin*, Jamaica.
7270. *Pinus sylvestris* (fabric from leaves), France.
7018. Pita (flossed), Honduras.
Plantain. (See *Musa paradisiaca*.)

5263. Pochote, *Bombax ceiba*, Guatemala.
7457. Pohate, *Bombax pendandrum*, Yucatan.
7411. *Populus alba* (down), Washington, D. C.
7079. *Pothos violaceus.*
7268. *Pterocarpus santalinus.*
7505. *Pucraria Thunbergiana* (woven fabric), Corea.
7269. Pulu, *Cibotium*, sp., Sandwich Islands.
7630. Ramie, *Bœhmeria nivea*, France.
7970. Ramie, *Bœhmeria nivea*, Jamaica.
7081. Ramie, *Bœhmeria nivea*, Mexico.
7080. Ramie (second cutting), *Bœhmeria nivea*, Mississippi.
7093. } Ramie, *Bœhmeria nivea*, Philadel-
7095. } phia.
7084. Ramie (from dresser), *Bœhmeria nivea.*
7639. Ramie (fabrics), *Bœhmeria nivea.* France.
7631. } Ramie (sliver and noils), *Bœhme-*
7632. } *ria nivea*, France.
7082. }
7083. } Ramie (tow), *Bœhmeria nivea.*
7312. Ramie, with wool, cotton, etc. (fabrics).
7099. *Raphia ruffia* (yarn), Madagascar.
7566. Reed of the Nile.
7504. Rhea, wild, *Dabregeasia longifolia*, India.
Rofia. (See *Raphia.*)
7673. Rofia palm (fabrics), Madagascar.
7978. Rush or flag grass, *Cladium occidentale*, Jamaica.
7264. Rush, sword, *Lepidospermum flexuosum*, Australia.
7573. *Sabal palmetto*, palmetto, Georgia.
7508. *Saccharum munja.*
5236. *Saccharum* sp., sugar cane, Hawaii.
5337. } *Sanseviera guineensis*, African bow-
7970. } string hemp, Jamaica.
7976. *Sanseviera zeylanica*, bowstring hemp, Jamaica.
7509. *Sarcocephalus cadamba*, Burmah.
7625. *Scirpus validus*, great bulrush, Arizona.
7511. *Scirpus validus*, tule or tutle, paper pulp, Idaho.
7114. Shina, *Tilia cordata*, var. *Hiroshima.*
7113. Shina, *Tilia cordata*, var. *Japonica.*
7033. *Sida Jamaicensis.*
7032. *Sida mollis.*
7028 } *Sida retusa*, Queensland hemp,
7031 } Australia.
5127. *Sida tiliæfolia*, coarse hemp, Kingma, China.
7582. Silk (cocoons), Argentine Republic.
7580. Silk (cocoons), Chili.
6915. Silk (cocoons), Japan.
7555. Silk tusser (cocoons), *Antheræa mylitta*, India.
7068. Silk (wild cocoons), Argentine Republic.
7098. Silk (wild cocoons), Madagascar.
7559. Silk, Bengal.
7067. Silk, Japan.
7262. Silk, raw, Japan.
93606. Silk, raw, from Yama Mai cocoons, Japan.
8061. }
8062. } Silk, raw, and cocoons, Mexico.
[illegible]58. Silk, raw, North Carolina.
69[illegible]3 Silk, reeled, *Bombyx pernyi*, China.
7583. Silk, reeled, Massachusetts.
7046. Silk, reeled, Japan.
7581. Silk, reeled, Kansas.
7260. Silk (from wild cocoons), Japan.
7899. }
7900. } Silk, wild, Mexico.
7954. Silk, wild, *Echinocactus horizonthalmum*, Mexico.
7261. Silk spun by spiders, *Epeira socialis*, Argentine Republic.
7455. Silk cotton.
5340. Silk grass, *Bromelia karatas*, Jamaica.
7257. Silk gut, Japan.
7337. Silk and banana (fabrics).
7616. Sipo, Brazil.
5302. Spanish bayonet (leaves), *Yucca alata.*
7286. Spear Lily, *Doryanthus excelsa*, Australia.
7294. *Sporobolus cryptandrus*, New Mexico.
6892. } Spruce root (rope), Washington
6893. } Territory.
6996. *Sterculia*, Australia.
7004. *Sterculia acerifolia*, Flame-tree, Australia.
7493. *Sterculia ornata*, Burmah.
7006. *Sterculia* sp., Australia.
7007. *Sterculia rupestris*, Bottle-tree, Australia.

7287. Stingy bark, *Eucalyptus obliqua*, Australia.
7565. Sugar-cane, bagasse, New Orleans.
5236. Sugar-cane, *Saccharum* sp., Hawaii.
7264. Sword-rush, *Lipidospermum flexuosum*, Australia.
7263. Tall Palm Lily, *Cordyline indivisa*, Australia.
7584. Tapestry Persian.
5179. Tea Weed, Mississippi.
7113. *Tilia cordata*, var. *Japonica*, Shina.
7114. *Tilia cordata*, var. *Hiroshima*, Shina.
6891. *Tillandsia usneoides*, Brazil.
7265. *Tillandsia usneoides*, South Carolina.
7969. Tipilapa de Buchivaca, Venezuela.
7533. Trée, cotton.
7295. Tree, nettle, *Laportea gigas*, Australia.
7498. *Triticum vulgare*, var. *æstivum*, Italy.
7109. *Triumfetta semitriloba*.
5345. Trumpet tree (bark), *Cecropia peltata*, Jamaica.
6873. } Tucum, *Astrocaryum vulgare*, Brazil.
6875. }
7511. Tule or tutle (paper pulp), *Scirpus validus*, Idaho.
7555. Tusser silk (cocoons), *Antheræa mylitta*.
6860. }
6861. } *Urena lobata*, Guaxima, Brazil.
6862. }
6863. *Urena lobata* (seeds) Guaxima, Brazil.
6893. } *Urena lobata*, Brazil.
6894. }
6895. *Urena sinuata*.
7112. Urena no kawa, *Acer crataegifolium*.
7115. *Urtica Thunbergiana*, Aiso.
6560. Vegetable silk, *Asclepias*, India.
6900. }
7155. } Vicunia wool, South America.
7354. }
7129. Vine and fiber (unidentified), India.
7118. *Wikstræmia Japonica*, Mitsumata.
7409. Wool. (See Cosmos).
7828. Wool.
7309. Wool (samples), Vermont.
7154. Wool, alpaca.
7918. }
7820. } Wool, Angora, Argentine Republic.
7821. }
7330. Wool, Angora, Maryland.
7245. Wool, black, Cordova.
7251. Wool, black yuli, Smyrna.
7813. Wool, cashmere, Alabama.
7407. Wool, cashmere, California.
7203. Wool, Donskoi, Russia.
7153. Wool, guanaco.
7406. Wool, kid's.
7152. Wool, lina, cross of sheep and goat, Argentine Republic.
5347. Wool, mountain goat, Russian America.
7404. Wool, Rocky Mountain goat, Indian Territory.
7201. Wool, Sardinian.
7155. }
7354. } Wool, vicunia, South America.
6900. }
7157. Wools, various American (samples).
7312. Wool, cotton, and ramie (fabric).
7332. Wool, cotton, and flax (fabric), New Mexico.
7569. *Xylopia* sp., Brazil.
6894. *Xylopia sericea*, Embirama, Brazil.
7044. Uta palm, *Mauritia flexuosa*, Demerara.
7403. Yucca (fabric and cord), Mexico.
5302. *Yucca alata* (leaves), Spanish bayonet.
6998. *Yucca aloifolia*, Adam's needle, Australia.
5343. }
7973. } *Yucca aloifolia*, Dagger plant, Jamaica.
6760. }
21065. *Yucca baccata* (coarse), Southern California.
21066. *Yucca baccata* (fine), Southern California.
6997. *Yucca baccata*, California.
7456. Yughau, Alogodon sylvestris.
7969. Yuguilla Venezuela.

The ultimate object of the collection represented by the foregoing list is to afford a series of type specimens of textile fibers, to be used in microscopical examinations, comparisons, etc. It will be seen that the list already embraces a large number of valuable types for this purpose. Mingled with these, however, purely for the temporary convenience of the curator, there are, at present, a number of specimens, representing much larger ones in the reserve and exhibition series, which have not been accurately determined and are awaiting further study. Hence in some cases only common or vernacular names are given in the list, the botanical names not being known.

In all cases the numbers in the margin are the regular Museum register numbers of the same fibers in the reserve or exhibition series.

PREPARATION OF MICROSCOPICAL MOUNTS OF VEGETABLE TEXTILE FIBERS.

By Romyn Hitchcock.

The method of mounting vegetable textile fibers here described has been adopted in the National Museum with perfect success. The permanent preparations leave nothing to be desired, for they clearly reveal the minute structure of the fibers, and their appearance does not change with time. Possibly the coarser fibers, after a few months, become rather more transparent than at first, but this change is so slight that it is of no consequence. Moreover, the process is simple, rapid and sure, even in the hands of a novice. In evidence of this statement it may be said, that Mr. H. English, a young man who had never made a microscopical mount before, in the summer of 1884 made one hundred and seventeen preparations of fibres in fluid mounts, from printed instructions, precisely as described below, having seen the operations performed two or three times by an experienced mounter, yet not one of his preparations has shown an imperfection up to the present time.*

The method is as follows: The fibers are cleaned, disintegrated, and prepared precisely as for microscopical investigation, the object being to make the mounted specimens resemble in every respect the freshly prepared fibers. The specimens for mounting are selected to show the variations in the size of the fibers, and the form of their ends. They are then placed in the mounting medium. This may be water without any addition, which is the medium most generally appropriate, or a mixture of water and glycerine in equal parts, which is to be recommended for the coarser and more opaque varieties.

The glass slips are prepared in advance by running upon them a thin ring of clear shellac in alcohol just large enough to receive the cover-glass. This is done on a turn-table, in the usual way. When this ring is thoroughly dry the mounting may be proceeded with. First put the slide again on the turn-table and run a fresh coat of shellac over the ring. Then, immediately or after a couple of minutes, put a large drop of the mounting fluid into the cell, transfer to it the specimen selected

*All of Mr. English's preparations are still perfect in 1889; five years after they were made.

for mounting, which must be already permeated with the fluid, apply the cover-glass and press out the superfluous fluid. Press down the cover until the edge comes in contact all around with the fresh shellac, absorbing the liquid that is forced out with blotting-paper. The slide may then be set aside for a few moments, when the cover will be well fixed and the moisture outside will be dried off, or, in case the mounting medium contained glycerine, the slide should be well washed with a stream of water from a wash-bottle. A fresh ring of shellac is then applied to secure the cover-glass and prevent any possible defect in the sealing. The preparation will now keep indefinitely if it is set aside and not handled roughly.

To insure permanent preservation a mixture of equal parts of gold-size and asphalt varnish or Brunswick black is applied over the shellac. One or more coats of this very durable and elastic varnish will protect the more brittle shellac and give a good finish to the mounts.

A more elegant finish is finally applied, consisting of a single coat of Brunswick black alone.

Finally, the slide is labeled, and the number on the label is the number of the original specimen in the Museum register.

HOW TO COLLECT MAMMAL SKINS FOR PURPOSES OF STUDY AND FOR MOUNTING.*

By William T. Hornaday, *Chief Taxidermist, U. S. National Museum.*

GENERAL PRINCIPLES.

It is a simple matter to prepare the skin of an ordinary quadruped, provided the operator is not afraid of getting a little blood on his hands, and is not naturally indisposed to physical exertion. A few minutes' work suffices for the skin of a small mammal, and a few hours for a large one, up to the size of a buffalo. With a sharp knife, detailed instructions, some cheap preservatives, and a little patient labor, the thing is done. One specimen properly prepared in the field is worth ten that have been slighted.

The great principle which is the foundation of all valuable field work on mammal skins is this: *A skin must be taken off, cleaned of flesh, and preserved so that the preservative powder or fluid can act directly upon the roots of the hair from the inner side of the skin, and over every portion of its surface.* Neither alum, nor salt, nor alcohol (unless it be of great strength) can strike through a thick layer of flesh and penetrate through the skin to the epidermis quickly enough to save it from decomposition. The epidermis of most animals is of such a close and oily nature that preservatives can not strike through it from without, and therefore when a skin is removed, it must be cleaned of flesh and fat, so that the preservative liquid or dry powder can come immediately in contact with the cutis.

SELECTION OF SPECIMENS.

When specimens are sufficiently numerous to allow of a choice of individuals for preservation, select first the finest, largest, and most perfect old male and female. Young animals of every kind are very desirable, and specimens should be taken whenever possible. Of animals that are known, or even supposed, to be rare, preserve the first speci-

*A portion of this article—that relating to the preservation of skins for mounting—has already been published in the *Proceedings of the National Museum* for 1883, under the title, "Brief Directions for Removing and Preserving the Skins of Mammals." The appearance of this circular is in response to a demand for detailed instructions for the preparation of skins in a dry state for the purposes of study.

men obtained, be it young or old, good or indifferent, for fear another of the same species may not be obtained.

NOTES AND MEASUREMENTS.

The value of a specimen is greatly enhanced by a record of the following: (1) Length of head and body; (2) length of tail; (3) length of hind foot (with claw); (4) height of ear (from behind); (5) height at shoulders (if the animal be a large one) and girth; (6) color of eyes; and (7) color of other soft parts of the head, feet, and body which are in any way worthy of notice. Sketches and photographs of animals in the flesh, either dead or alive, are always highly prized by zoologists and taxidermists, to whom they are of the utmost importance and value.

KNIVES AND MATERIALS.

For skinning small quadrupeds, a sharp pocket-knife is sufficient, except for persons who make a business of collecting; and for larger animals small butcher or hunting knives are amply sufficient. Alcohol in copper cans with large screw-tops is supplied by the Institution by special arrangement, but salt and alum, with which to make a good preservative solution, can be procured anywhere within the pale of civilization, and also kegs or barrels to put them in. Any one who really wishes to preserve the skin of an animal need never be thwarted by an apparent lack of implements and preservatives.

SKINNING SMALL QUADRUPEDS (VARYING IN SIZE FROM A MOUSE TO A MASTIFF).

Lay the animal flat upon its back, and, beginning at the throat, make a straight, clean cut in the skin along the middle of the neck, breast, and abdomen, quite to the base of the tail. Except in very small animals, the tail also must be slit open along the under side from about one inch above the root quite to the tip. In the case of small mammals, the skins of which are to be preserved dry, the bone of the tail may be extracted by wrapping the latter with cloth and pounding lightly upon it with a mallet.

The bottom of the foot must be slit open lengthwise from the base of the middle toe to the heel. All the opening cuts are now made. Begin at the middle of the abdomen and cut the skin neatly from the body, leaving no flesh, or at least very little, adhering to it. We come very soon to where the fore-leg joins the body at the shoulder and the hind leg at the hip. Cut through the muscles at those points, disjoint the legs and detach them entirely from the body.

Skin each leg by turning the skin wrong side out over the foot, quite down to the toes. When this has been done cut the flesh away from the bones of the leg and foot, but be careful to leave the bones attached to each other by their ligaments, and to the skin itself at the toes. *Never throw away the leg-bones of an animal if the skin is to be mounted*,

but leave them attached to the skin as shown by the left leg of the accompanying figure.*

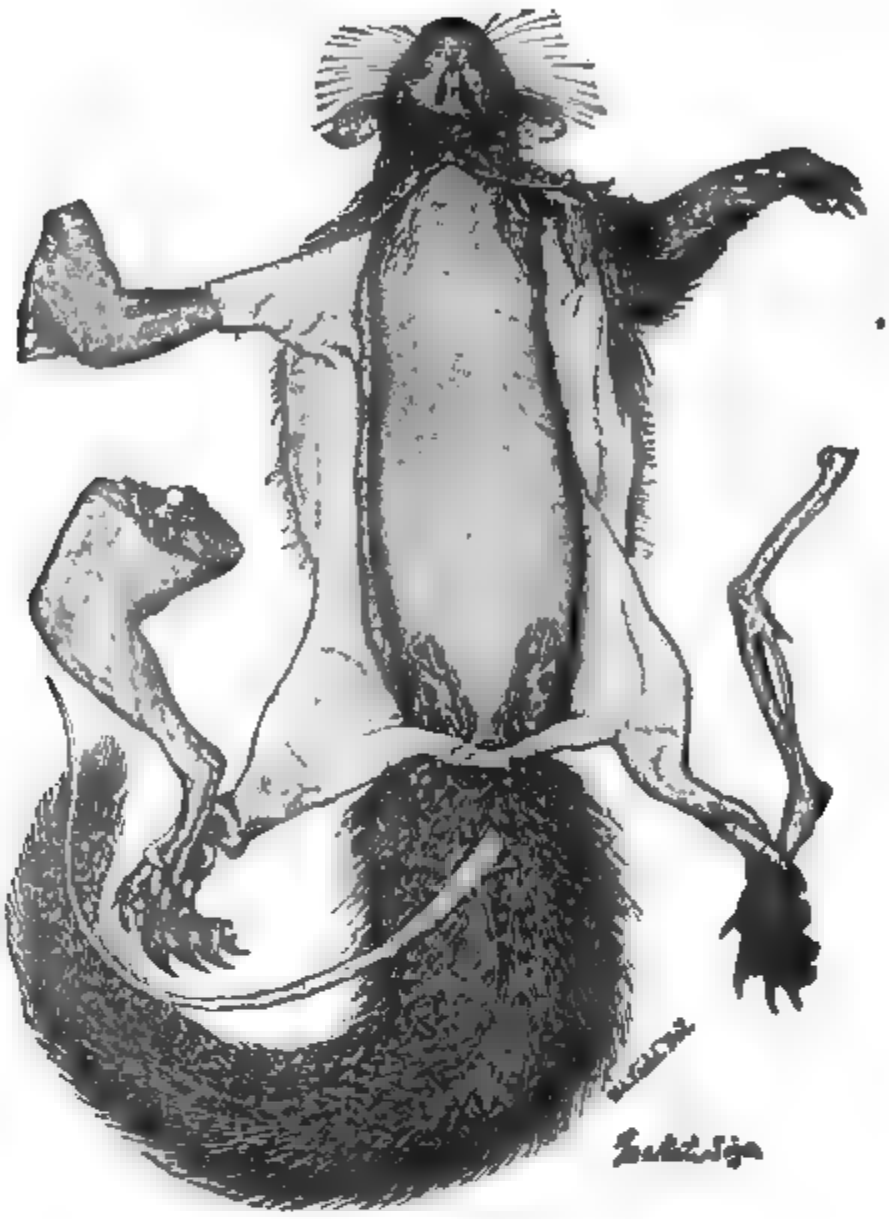

FIG. 1.—Squirrel partly skinned.

Detach the skin from the back, shoulders, and neck, and when you come to the ears cut them off close to the head. Turn the skin wrong side out over the head and proceed until you come to the eyes. Now work slowly with the knife, keeping close to the edge of the bony orbit, until you can see, through a thin membrane under your knife-edge, the dark portion of the eye. You may now cut fearlessly through this membrane and expose the eyeball. It is a good plan with large mammals to hold one finger of the left hand in the eye and cut against it to avoid cutting the lid.

Skin down to the end of the nose, cut through the cartilage close to the bone, and cut on down to where the upper lip joins the gum. Cut both lips away from the skull close to the bone all the way around the mouth, except directly in front of the incisors.

The lips are thick and fleshy, and must be split open from the inside and flattened out so that the flesh in them can be pared off. Do not cut off the roots of the whiskers, or they will fall out. Pare away the

* The figures accompanying this article are selections from plates intended to illustrate a forthcoming work on taxidermy.

membrane which adheres to the inside of the eyelids and turn the ear wrong side out at the base in order to cut away the flesh around it.

FIG 2.—Skinning the head.

If the ears have hair upon them they must be skinned up from the inside and turned wrong side out quite to the tip, in order to separate the outside skin, which holds the hair, from the cartilage which supports the ear.

To prepare the skull, cut the larger masses of flesh off the cranium, cut out the eyes and tongue very carefully, and with a bent wire, or a spoon-handle bent up at the end, draw out the brain through the occipital opening at the back of the skull.

By this time the skin will most surely have become bloody in several places, and before applying any preservative it must be washed *perfectly clean*. Blood left upon the hair imparts to it a lasting stain, and usually causes the hair to come off in mounting. After washing a skin, if it is to be made up at once, dry the hair with corn meal.

SKINNING LARGE MAMMALS.

The principal difference between the manner of skinning a small terrestrial quadruped and a large one, like a bear, deer, or buffalo, is that the skin of each leg is slit open from the bottom of the foot up the back

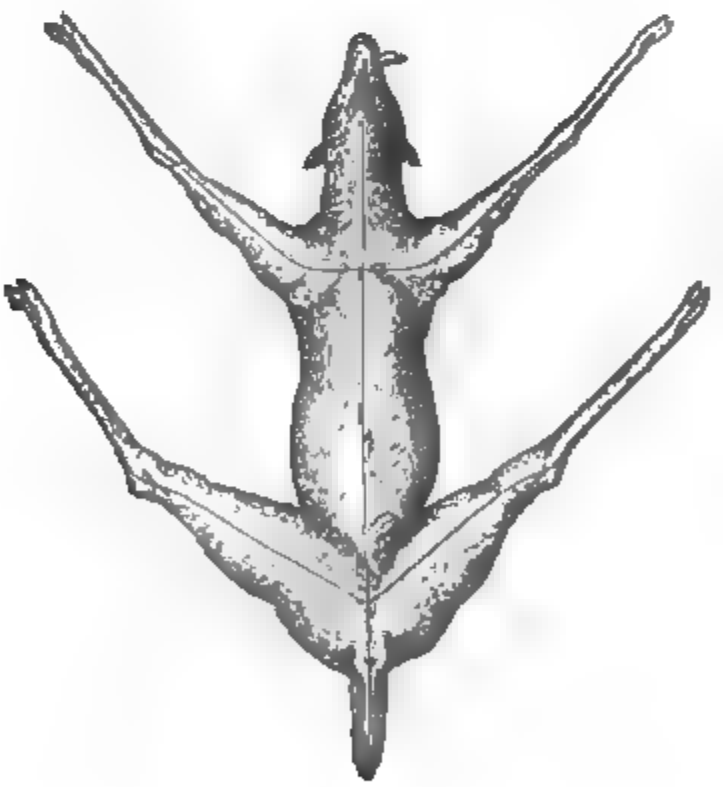

FIG. 3.—The opening-cuts.

of the leg nearly the first joint and from thence up the inside of the leg, following the lines of the accompanying figure, until it meets the

opening-cut which has been made along the center of the body. In preparing a skin as large as that of a buffalo or large polar bear, it is best to cut off the leg-bones at the first joint above the foot, tie them up in a bundle with the skull, and *forward them with the skin*, properly labeled.

In skinning the head of an animal having horns, it is necessary to make an opening at the back of the neck. Make the cuts as shown by the lines of the accompanying figure, cut completely around each horn

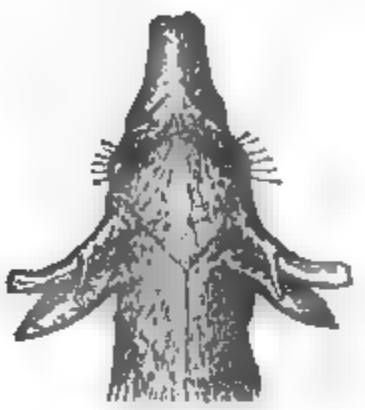

FIG. 4.—Opening-cuts at back of head.

at the base, and skin the head by working downward over the forehead and the cheeks. The head-skin of a large mammal is the most difficult part to remove and preserve successfully, and therefore the greatest care is necessary in its preparation.

PRESERVING SKINS IN A DRY STATE.

Skins of mammals may be preserved dry for any one of the following reasons:

(1) For purposes of study, during which frequent handling and examination is absolutely necessary.

(2) Lack of facilities for preserving in a soft state, which should always, when possible, be the method of treatment *for skins that are to be mounted.*

(3) The necessities of transportation; or, in other words, when it is necessary to reduce the weight of a collection to the lowest possible limit, and divide it into a number of loads for carriage overland.

One point in regard to study specimens must be constantly borne in mind, viz, that any specimen which enters a museum may possibly require mounting for exhibition, and all should be prepared in strict accordance with the advice which follows, in order that successful mounting may be possible in every case.

A.—FOR SMALL MAMMALS, IN ANY CLIMATE, VARYING IN SIZE FROM THE SMALLEST UP TO THE COYOTE.

Preservation.—When the skin has been removed and cleaned, the flesh neatly cut away from the leg-bones and skull, the brain very carefully removed from the latter, and all blood washed away, anoint the

inside of the skin with arsenical soap, applying it thoroughly to every part, so that the specimens will not require a second course of poisoning when they reach the museum. That done, rub on powdered alum, all that will stick to the skin, before the arsenical soap has time to dry, so that both will penetrate the skin together.

In the absence of arsenical soap, apply a mixture of dry arsenic (one-third) and powdered alum (two-thirds). Whenever the inside of a skin becomes so dry that the powdered arsenic and alum will not stick, moisten the inside of the skin with water, so that the preservative powder will form a sort of paste which can penetrate the skin.

Making up.—Having applied the preservatives, wrap a little tow, cotton, or rags around the bones of each leg, to partly replace the flesh and keep the skin away from the bone, so that both can dry quickly. This is also desirable in order that the legs may have a shapely, natural appearance, and show the pelage, so that it can be studied to good advantage. If this part of the process is neglected, the skin of the leg shrivels up and dries down upon the bone in a most unsightly way. In the tropics, the moisture in a leg-bone is sufficient to cause the decay of the skin which surrounds it, unless the two are well separated by some kind of wrapping. To avoid this, many collectors in tropical countries allow their skins to dry *wrong side out*—a very bad habit, which should never be indulged in under any circumstances, as thereby the skins are, in most cases, rendered totally worthless.

FIG. 5.—A badly made skin.

Having wrapped the leg-bones (just enough to bring them to their original size, but no more), turn the skin of each leg right side out over the bone and make the member as shapely and natural as your time will allow.

It has become an established custom in preparing skins to replace the cleaned skulls in the head, so that they can not possibly be lost. This is in general a good system, but in preparing skins for the National Museum remove the skull entirely from the skin. In this connection it is of the highest importance:

(1) That skulls never be allowed to get mixed, so that the collector or the curator is left in doubt as to which skins the various skulls belong.

(2) To prevent confusion by *attaching to each skull a label with a number or a mark corresponding to that which is tied to the skin.*

(3) To tie every small skull to the skin it comes from, and ship all large ones in the boxes which contain their skins.

In cleaning a skull, do not cut or chop away the back of it. This greatly lessens its scientific value, and in many cases destroys it altogether. Remove the brain, cut off all the flesh you can, and leave the remainder to dry up. Never put salt or alum on the skulls, especially if of small size.

In making up the skin, fill out the head, neck, and body with cotton or tow, to about the natural size of the animal when alive, *but no larger. Better leave it too small than fill it too full.* With a needle and thread take a stitch in the center of the lips to hold them together in drying. Sew up the skin to give it a neat appearance, and comb the hair so that it will lie naturally on all parts and show the texture and color-markings to the best advantage.

FIG. 6.—The best form for a small dry skin.

Shaping.—The ends to be sought in laying out a skin to dry are, to have it take up a limited amount of space in a drawer, to have all breakable points protected, and at the same time to have all parts of the specimen accessible for examination. The shape of a skin, therefore, must depend on its character and general nature. The accompanying figure represents the best form for the skin of a squirrel and all similar mammals.

To protect the tail from being broken, it is necessary in making up a skin in this form to put a wire in it for its whole length. For this purpose, use copper or zinc wire, for the reason that iron wire rusts and in time destroys the skin of the tail so that it falls away in small pieces. In making up the skin, cut the wire for the tail long enough to extend into the middle of the body, and wrap around it some fine tow to make it the right size to fit the skin. Some collectors wire all the legs of

small skins, which is a good plan if time will permit, as it makes it possible to place the legs in the exact position it is desired they should permanently retain.

This method of shaping small skins (e. g., with the tail extending straight back) should always be followed by American collectors, who can easily command the facilities necessary to render it safe and advisable. But for collectors who visit remote localities, and often have to transport their impedimenta for many miles on men's heads, done up in small bundles, and where every pound in weight and every cubic foot of space is carefully counted, another method must be recommended. Under such circumstances, small skins should be made up with the tail bent under the body, as seen in Fig. 7. The position is not unnatural, the general form is compact, the tail is fully protected by being bent under the body and tied down upon it, and the legs are not thrust out in such a way as to endanger the safety of the feet and claws. Animals with long slender legs, such as monkeys, sloths, etc., should be put up with the fore legs lying close against the sides, in the opposite direction from those of the squirrel shown in the figure.

FIG 7.—Another form for a small skin.

B.—For Large Mammals.

Preservation.—On dry uplands most skins can be cured and dried very successfully by the use of salt alone. Indeed, on our western plains, the llanos of South America, and the high plateaus of Asia, to say nothing of the parched bush-veldt of South Central Africa, mammal skins dry and harden in an incredibly short time without the use of any preservative whatever. In such regions it is only necessary to apply a good coat of arsenical soap to keep off the vermin which would otherwise destroy them, and to keep them out of the sun.

In a more moist climate salt must be used to cure skins, so that the epidermis will not slip off in the slower process of drying. In the humid heat of the tropics, it is necessary to apply dry alum after the salt has done the curing, in order to make the skins become perfectly

dry and hard. Apply arsenical soap to everything, or its absence will be bitterly regretted when too late.

Do not "peg out" a skin, nor dry it in the sun under any circumstances, nor hang it up by the nose. Hang it over a pole or a rope, in a shady place where the wind will strike it. If it is necessary to travel some distance with a skin before it can be dried and shaped, salt it thoroughly to keep it from spoiling.

Shaping.—Since these directions will be used chiefly in preparing the skins of deer, antelope, and kindred ruminants, the accompanying illustration is given to show how such skins should be made up when they

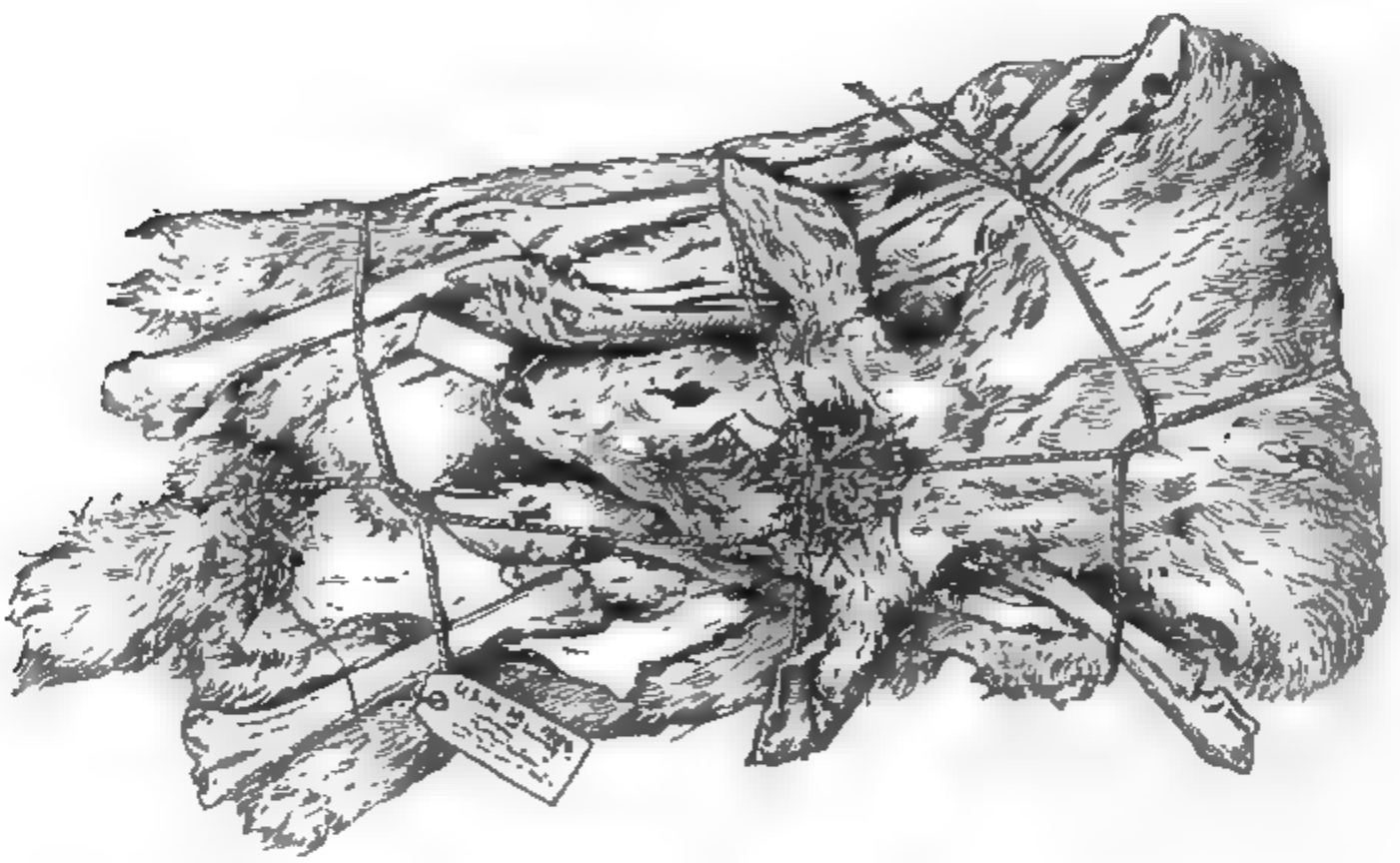

FIG. 8.—A well-made dry deer skin.

are to be preserved dry, either for study or for mounting. It is best to defer folding up a skin until it is partially dry and has begun to stiffen a little.

Fill the head and neck with some kind of loose material, and as the skin lies spread out with the hair side down, put some of the same material in a thin layer on the body. Fold over the edges neatly, placing the legs lengthwise on the top, and arrange the legs so that they will dry straight and flat instead of twisted like a cork-screw. A skin which is allowed to dry in such shape as that represented in Fig. 9 is of no use whatever, either for study or mounting. The skin of which this illustration is an exact representation was prepared thus in the field by a professional taxidermist. It may be taken as a good example of how *not* to do it.

Handling and packing.—It is unfortunate that it should be necessary to fold and dry large skins with the hair side out, for the pelage is thus in constant danger of damage; but for skins that are to be examined

in a dry state there is no alternative. They must be handled carefully when handled at all, and when prepared for shipment must be *packed on all sides with straw, shavings, hay, or some other soft material*, which will keep the hair away from the sides of the box. A large elk skin

FIG 9.—A badly made dry deer skin.

recently received by the Museum was ruined by not being packed properly. There was no filling around it to keep it away from the rough boards of the box, and consequently the hair was rubbed off in about twenty places.

PRESERVING SKINS FOR MOUNTING.

A great many collectors and sportsmen are often specially called upon to procure skins for immediate mounting, and it is always desired that these should be as perfect in every respect as possible.

Let me here call the attention of all collectors to the following fact:

A mammal skin which has never been dried and hardened can be mounted in one third less time and with far greater accuracy than the best dry skin of the same kind.

This being the case, it is certainly worth while to preserve skins in a soft state. A skin may be removed very unskillfully, but if kept soft until it reaches the taxidermist, it can be mounted with gratifying success. On the other hand, the dry skins of the most experienced collector can be mounted well only with difficulty.

The following methods are recommended:

In a temperate climate.—Under ordinary circumstances, in a temperate climate a skin may be preserved in a soft state by rubbing salt very thoroughly on the inside, and then leaving the skin turned wrong-side

out, packing it in salt, and shipping it in that condition as soon as possible. A better method, or rather *the best of all methods for any climate and all kinds of skins*, is to prepare a solution of salt and alum in water in the following proportions: For every gallon of water put in one pint of alum (three-fourths of a pound) and one quart of salt (one pound and three-fourths), stir it up, and heat it to the boiling point. Pour it into a wooden or earthen vessel, and when cool, or milk warm, it is ready for use. Plunge a skin into this bath and move it about until the solution reaches every part. Give a fresh skin plenty of room for the first day or two, and if it be a large one move it about every day for three days so that the solution can act with full force on every part.

Fresh skins of all kinds may be placed in this bath (leg-bones of small skins may also be left attached) and allowed to remain in it for months without deteriorating in any way; even after five years they are still as soft and pliable as when first taken off. *The skulls should invariably be detached from the skins and dried.* Small skins may be shipped in glass jars or wooden kegs, and large ones in barrels.

If you have alcohol sufficiently strong (30° *above* proof), skins may be immersed in it as fast as collected, instead of in the salt and alum solution. The objections to alcohol are that it loses strength very rapidly when receiving daily accessions of fresh skins, *bleaches hair*, and must be renewed from time to time until the collection is finally packed in fresh alcohol and shipped.

In an arctic climate.—As before stated, the salt-and-alum solution is *the best wet preservative for skins in all climates*, and for all objects from the largest elephant, seal, walrus, or polar bear, down to the smallest bat of the tropics. If it is impossible or impracticable to employ it, the skins of all large arctic mammals may be successfully preserved by immersing them in *very strong* brine, but it should be renewed at least once or twice. The skins of seals and small mammals may be simply packed in salt. Care should be taken that skins are not stained with iron-rust derived from nails projecting into the barrels or other receptacles in which they are placed.

In a tropical climate.—Skins can not be preserved with salt in a tropical climate, but must be immersed either in the salt and-alum solution, or alcohol, or else dried.

SPECIMENS IN THE FLESH.

The most valuable of all specimens which come to us are those sent in the flesh. A rare animal so received is sometimes cast in plaster, skinned, dissected, and skeletonized; and portions of the viscera may be preserved in spirits for anatomical study. In this way a single subject is often made to yield a number of valuable preparations. The Institution will be very glad to receive the dead body of any foreign animal which may die in the eastern United States, and also of any rare or especially fine North American species.

FORWARDING ANIMALS IN THE FLESH.

In cold weather, particularly from December 1 to March 1, a dead animal may safely be sent (frozen) from as far west as the Rocky Mountains. In the cool months of November and March specimens may safely be forwarded from points 500 miles distant. From May to October animals should be disemboweled and packed in ice when sent from points more than twelve hours by rail from Washington.

Large animals with thick hair, such as deer, elk, moose, bear, etc., can be sent without boxing, but it will be well to sew them up in coarse sacking to protect the hair. Small animals and others with close hair, such as the zebra, lion, tiger, or giraffe should be boxed and packed in straw or shavings to protect the hair from being rubbed off. Animals of the largest size, such as rhinoceros, elephant, or hippopotamus must be skinned and skeletonized where they die by our own preparators, who hold themselves in readiness to start at once for any point, on the receipt of information by telegraph.

The Smithsonian Institution will pay all charges for boxing and cartage upon presentation of vouchers in regular form, and all freight and express charges will be met here. As a rule, dead animals should always be sent by express, the exceptions being in the cases of large animals forwarded from a great distance in the middle of winter, when they could as safely come by freight.

All donations are promptly acknowledged by the director of the Museum, both by letter and in the annual report, and the names of donors also appear in the catalogues, and upon the large printed labels attached to their specimens in the exhibition cases.

TRANSPORTATION.

Specimens should be very securely packed previous to shipment, and plainly addressed as follows: "*Smithsonian Institution, Washington, D. C.: for the National Museum. Perishable.*" Shipments may be forwarded by Government vessels when available, or by the ordinary lines of transportation at the expense of the Institution.

In case immediate information or instructions are required in relation to any dead animal of special importance, which is at the disposal of the institution, the donor or his representative may telegraph without paying charges.

Telegrams and correspondence should be addressed to "*Prof. S. P. Langley, Secretary, Smithsonian Institution, Washington, D. C.*"

In all cases the *utmost dispatch* is necessary in order that specimens sent may reach us in good condition for anatomical study and dissection.

U. S. NATIONAL MUSEUM,
Washington, D. C., April 12, 1886.

PART IV.

BIBLIOGRAPHY OF THE U S. NATIONAL MUSEUM DURING THE YEAR ENDING JUNE 30, 1886.

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BIBLIOGRAPHY OF THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1886.

I.—PUBLICATIONS OF THE MUSEUM.

The following is a list of the twenty-six signatures (including four hundred and twelve pages) of the "Proceedings of the U. S. National Museum," published between July 1, 1885, and July 1, 1886.*

Date.	Signature number.	Pages.	Date.	Signature number.	Pages.
July 13	15	225–240	Sept. 22	28	433–448
13	16	241–256	23	29	449–464
13	17	257–272	23	30	465–480
13	18	273–288	23	31	481–496
Aug. 6	19	289–304	28	32	497–512
7	20	305–320	30	33	513–528
7	21	321–336	30	34	529–544
Sept. 2	22	337–352	30	35	545–560
2	23	353–368	Oct. 17	36	561–576
2	24	369–384	19	37	577–592
2	25	385–400	30	38	593–608
14	26	401–416	Nov. 3	39	609–624
17	27	417–432	Dec. 7	40	625–636

The following bulletins of the U. S. National Museum appeared during the year:

Department of the Interior: | U. S. National Museum. | — | Bulletin | of the | United States National Museum | No. 23. | Bibliographies of American naturalists.†— | II. The published writings of Isaac Lea, LL. D. | by | Newton Pratt Scudder | — | Washington: | Government Printing Office. | 1885.

8vo. pp. I–LIX. 1-278. One plate.

Department of the Interior: | U. S. National Museum. | — | Bulletin | of the | United States National Museum. | — | No. 28. | A manual of American land shells. | By | W. G. Binney. | — | Washington: | Government Printing Office. | 1885.

8vo. pp. 1–528. 516 figures.

* No signatures printed during the first six months of 1886.

† Parts I and III have also been published; the former as Bulletin 20, Publications of Spencer Fullerton Baird, by G. Brown Goode; the latter is mentioned below as Bulletin 30, for which see also Bibliography, Part II, under John Belknap Marcou.

Department of the Interior: | U. S. National Museum. | — | Bulletin | of the | United States National Museum. | No. 29. | Results of ornithological explorations in the | Commander Islands and Kamtschatka | by | Leonhard Stejneger. | — | Washington: | Government Printing Office. | 1885.

8vo. pp. 1–382. Plates 1–8.

Department of the Interior: | U. S. National Museum. | — | Bulletin | of the | United States National Museum. | No. 30. | Bibliographies of American naturalists.— | III. Publications relating to fossil invertebrates | by | John Belknap Marcou. | — | Washington: | Government Printing Office. | 1885.

8vo. pp. 1–333.

Circulars No. 34 and No. 35 were published as separates during this year. They bear the following titles:

No. 34. Circular for the guidance of persons desiring to make exchanges of birds or birds' eggs with the National Museum.

8vo. One page.

No. 35. Concerning the lending of type specimens.

8vo. One page.

II.—PAPERS BY OFFICERS OF THE MUSEUM AND OTHER INVESTIGATORS WHOSE WRITINGS ARE BASED DIRECTLY OR INDIRECTLY ON MUSEUM MATERIAL.

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AMERICAN ORNITHOLOGISTS' UNION. The Code of Nomenclature | and | Check-list | of | Northern American Birds | Adopted by the American Ornithologists' Union | Being the report of the Committee of the | Union on Classification and | Nomenclature | — | Zoölogical Nomenclature is a means, not an end, of Zoölogical Science | — | New York | American Ornithologists' Union | 1886.

8vo. pp. 1–VIII, 1–392.

Although not a National Museum publication, and only partially prepared by officers of the Museum, this comprehensive volume was based upon work of the committee charged with its preparation during sessions held in the office and laboratories of the department of birds, upon researches in the Museum library, examination of specimens in the Museum collection, and critical investigations connected with the regular work of the Department.

The manuscript of the check-list was prepared chiefly by the curator and assistant curator; Mr. J. A. Allen, president of the Union and member of the committee, adding only the habitats and concordance of numbers. The preparation of this MSS. involved an immense amount of research, rendered necessary in order to determine beyond reasonable question the earliest available name of each species. They also revised carefully galley and paged proofs, not only of the check-list proper, but of the Code of Nomenclature, and conducted an extended correspondence with other members of the committee, whose work upon the book was chiefly of an advisory nature. The committee was composed of the following members: J. A. Allen, William Brewster, Elliot Coues, H. W. Henshaw, and Robert Ridgway. Dr. Leonhard Stejneger took part in the deliberations of the committee and prepared part of the check-list by special invitation.

CHARLES G. ATKINS. The biennial spawning of salmon.

Forest and Stream, XXV, No. 9, Sept. 24, 1885, p. 169.

TARLETON H. BEAN. Description of a new species of *Pempheris* (*Pempheris poeyi*) from Cuba.

Proc. U. S. Nat. Mus., VIII, July 13, 1885, p. 229.

TARLETON H. BEAN. Notes on *Epinephelus nigritus*, *Caulolatilus microps* and *Coryphæna hippurus*.

Proc. U. S. Nat. Mus., VIII, July 13, 1885, pp. 230–233.

TARLETON H. BEAN. Rocky Mountain Whitefish.

Forest and Stream, XXV, No. 20, Dec. 10, 1885, p. 390.

TARLETON H. BEAN. The Trout of Sunapee Lake.

Forest and Stream, XXVI, No. 7, March 16, 1886, pp. 129–130.

TARLETON H. BEAN. Comments on *Zygonectes manni* and *Zygonectes auroguttatus*, Hay.

Proc. U. S. Nat. Mus., VIII, Sept. 30, 1885, p. 555.

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* Connected with the National Museum.

TARLETON H. BEAN and G. BROWN GOODE. Description of *Leptophidium cervinum* and *L. marmoratum*, new fishes from deep water off the Atlantic and Gulf coasts.

Proc. U. S. Nat. Mus., VIII, Sept. 17, 1885, pp. 422–424.

See under G. Brown Goode.

TARLETON H. BEAN and G. BROWN GOODE. Description of new fishes obtained by the U. S. Fish Commission, mainly from deep water off the Atlantic and Gulf coasts.

Proc. U. S. Nat. Mus., VIII, Oct. 19 and 30, 1885, pp. 589–605.

See under G. Brown Goode and Tarleton H. Bean.

CHARLES W. BECKHAM. Remarks upon the plumage of *Regulus calendula*.

Proc. U. S. Nat. Mus., VIII, Dec. 7, 1885, pp. 625–628.

Proves that the female does not have the brightly-colored crown and that some young males in autumn do possess this ornament.

CHARLES W. BECKHAM. Changes in the Plumage of *Geothlypis trichas*.

The Auk, III, April, 1886, pp. 279–281.

States that the males not only never assume the plumage of the female after having once attained the masculine livery, but that young birds molt directly into a plumage approaching that of the adult males.

CHARLES W. BECKHAM. Kentucky Geological Survey. | John R. Proctor, Director. | — | List of the | Birds of Nelson County. | — | By Charles Wickliffe Beckham. | — | Electrotyped for the Survey by John D. Woods, public printer and binder, Frankfort, Ky.

Royal quarto. pp. 1–59.

Published by the Kentucky Geological Survey. An annotated list of one hundred and seventy-one species. A great many of the specimens upon which the remarks are based have been presented to the Museum by the author.

HENRY G. BEYER. The influence of variation of temperature upon the rate and work of the heart of the Slider Terrapin, *Pseudemys rugosa*.

Proc. U. S. Nat. Mus., VIII, July 13, 1885, pp. 225–229. Plates XV–XVI.

In this paper, which is but a preliminary account of the subject, it is conclusively shown by experiment that, although the rate of the heart moves with the temperature of the blood which circulates through this organ, the work done increases with that temperature only up to a certain limit, and then rapidly goes down. This limit may be found different for the different animals. Heat being, no doubt, a musculo-motor stimulant, the decrease in the work done by the heart consequent upon passing blood of an abnormally high temperature through it, must be conceived as due to exhaustion from over stimulation of the musculo-motor apparatus.

It was found in these experiments that, when blood of comparatively high temperature was allowed to circulate through the heart, that the latter is moreover considerably reduced in volume, and both systole and diastole are shortened. Blood of a lower temperature, on the contrary, caused a very marked prolongation of the diastole and systole, and also a very decided increase in the volume of the heart.

Blood of low temperature, therefore, though reducing the rate and the work done in a given time, by prolonging the diastolic excursions and giving rise to considerable enlargement of the organ, causes the heart to pump more blood around with each systolic contraction than blood of a high temperature does. In respect to its influence upon the heart, therefore, heat resembles atropine used in small doses, and cold resembles it as when it is used in large doses.

HENRY G. BEYER. The influence of Kairin, Thallin, Hydro- | chinon, Resorcin and Antipyrin, on | the Heart an dBlood-vessels. | By | H. G. Beyer, M. D., M. R. C. S., | Passed Assistant Surgeon, U. S. N., Honorary Curator, Section Materia Medica, | U. S. National Museum. | — | from | The American Journal of the Medical Sciences | April, 1886.

8vo. pp. 1–34.

Published as a separate.

In this paper the action of the so-called antipyretics on the heart and blood vessels is treated quite exhaustively. The paper itself is but a summary of the results which were obtained from a large number of experiments, and all that need be said here is that antipyrin was found to be the only real remedy among them.

HENRY G. BEYER. The Influence of Cocaine, Atropine | and Caffeine on the Heart | and Blood-vessels. | By | H. G. Beyer, M. D., M. R. C. S., | Passed Assistant Surgeon, U. S. N., Honorary Curator, Section Materia Medica, | U. S. National Museum. | — | From | The American Journal of the Medical Sciences. | July, 1885.

8vo. pp. 1–31. Plates, 2.

Also published under the title "Biological deductions from a comparative study of the influence of Cocaine and Atropine on the Organs of Circulation." (Abstract.) *Proc. Am. Ass. Adv. Sci.*, XXXIV, 1885, pp. 318–321. This abstract and the one below published together as separates.

In this paper the conclusions arrived at were stated to be about as follows, viz: The atropine-muscarine antagonism, as manifested by the heart, is probably of a muscular nature rather than a nervous phenomenon, as has been supposed hitherto. Atropine stimulates the endings of both vagus and accelerator nerves within the heart as well as the muscular substance of the organ. Cocaine affects the nerve-endings in the same manner as atropine does; but, unlike the latter, has no stimulatory action on the muscular substance of the heart.

HENRY G. BEYER. A Study of the Structure of *Lingula* (*Glottidia*) *pyramidata* Stimp. (Dall), by H. G. Beyer, M. D., F. R. C. S., Passed Assistant Surgeon, U. S. Navy, Honorary Curator, Section Materia Medica, U. S. National Museum.

Studies from the Biological Laboratory (Johns Hopkins University), III, No. 5, 1886, pp. 227–265.

Also as the Structure of *Glottidia pyramidata* (Stimp.) Dall. (Abstract.) *Proc. Am. Ass. Adv. Sci.*, XXXIV, 1885, pp. 321–324.

This abstract and the one immediately above published together as separates.

The following are the prominent points brought out in this paper:

1. *Shell-structure.*—The so-called horny layers of the shell are not identical in structure with the periostracum, but are composed of supporting tissue and represent the homologues of the vertical septa in Testicardine brachiopods.

2. *Body-wall, mantle, and peduncle.*—Consist of three layers, namely: An outer ectodermal covering, made up of one or more layers of small cuboidal nucleated cells, a middle layer of supporting substance, variously modified according to situation, and an internal layer of lining peritoneal epithelium, which latter is flattened and is provided with a small central nucleus.

3. *Alimentary canal.*—Consists of three layers throughout its whole extent, viz: *a*, an external layer of very loose supporting substance, covered on its outer side with peritoneal epithelium and blood-corpuscles; *b*, a middle layer of extremely minute and very little differentiated cells; *c*, an internal layer of long and very narrow ciliated cells. The intestinal canal opens by an anus into the mantle-chamber.

4. *Muscular structure.*—All the muscles were found to be of the non-striated variety. Certain structures which have been described as parietal muscles and as the muscle of the peduncle were found to possess the characters of mesenchymatous-supporting substance and were, accordingly, relegated to that class of tissues rather than muscles.

5. *Vascular system.*—No central circulatory propelling organ nor a closed system of blood-vessels were found, but, instead, two oblong, pyriform, sack-like organs, situated on either side of the œsophagus, which, it was thought, might perhaps function as heart.

6. *Nervous system.*—Is subectodermal and consists of five ganglionic enlargements, which, from their respective situations, were termed as follows:

(1) the large central subœsophageal ganglion; (2) the two dorso-lateral or supra-œsophageal ganglia; (3) the two ventro-lateral ganglia. They are all joined together by a circum-œsophageal commissure of fine nerve-fibers. That portion of the commissures connecting the ventro-lateral with the dorso-lateral ganglia is double. Both multipolar and apolar nerve-cells were found, all of them being comparatively small and consisting of a finely granular protoplasm with a small round central nucleus.

7. *Genital organs.*—Both male and female organs of generation were found present within the same individual. The mantle-sinuses inclose a band, termed the "genital band," from which ova, as well as spermatophores are developed. Within the body-cavity the ova spring more exclusively from the peritoneal membrane, covering the mesenteric bands and their reflected portions, while the spermatophores develop from the spongy net-work of supporting substance covering the lateral body-wall on its inner surface.

WILLIAM G. BINNEY. Department of the Interior: | U. S. National Museum. | — | Bulletin | of the | U. S. National Museum. | No. 28. | A Manual of American Land Shells. | By | W. G. Binney. | — | Washington: | Government Printing Office. | 1885.

8vo. pp. 1–528, 516 figures.

A general manual, illustrated with wood-cuts, treating of the species systematically under each malacological province.

HERBERT BROWN. Arizona Quail. (Notes.)

Forest and Stream, XXV, Dec. 31, 1885, No. 23, p. 445.

WALTER E. BRYANT. The relationship of *Podiceps occidentalis* and *P. clarkii*.

The Auk; II, July, 1885, pp. 313–314.

Inclines to the opinion that the differences between the two alleged species are only sexual. Conclusions based partly on twenty-five specimens in the National Museum.

KATHARINE J. BUSH. Additions to the Shallow-Water Mollusca of Cape Hatteras, North Carolina, dredged by the U. S. Fish Commission steamer *Albatross* in 1883 and 1884.

Trans. Conn. Acad., VI, part II, June, 1885, pp. 453–480, plate XLV.

The following list is intended to include only species not previously recorded from the region of Cape Hatteras between low-water mark and 50 fathoms, although in one or two instances recorded species are mentioned where there is some variation from the original description or doubt as to their identity. It is by no means complete, as there are still a number of species which have not been satisfactorily identified. There is also a large amount of fine shell-sand which has not yet been assorted.

At the end a list is given of deep-water species found in not less than 40 fathoms, many of which have not before been found so far south.

A list of the dredging stations made by the *Albatross* in the region of Cape Hatteras, with the date regarding them, is given on page 454. Eighty-four species of mollusca are enumerated from less than 50 fathoms, including thirteen new species and one new variety, which are described and mostly figured. Descriptions of some of the old species are also given. The new species are as follows:

GASTROPODA.

	Page.
Mangilia psila, pl. xlv, fig. 2	455
eritima	456
ceroplasta	458
Skenea trilix, pl. xlv, figs. 7, 7*a*	464
Scalaria leptalea	465
teres, pl. xlv, fig. 8	465
Odostomia engonia	466
var. *teres*, pl. xlv, fig. 9	467
Cylichna cælata, pl. xlv, fig. 15	468
Volvula oxylata, pl. xlv, fig. 12	468
minuta, pl. xlv, fig. 11	469

SOLENOCONCHA.

Cadulus incisus, pl. xlv, fig. 20	471

LAMELLIBRANCHIATA.

Pandora carolinensis	474
Venericardia obliqua	478

The following additional species are figured on plate XLV:

Mangilia ephamilia Bush, figs. 4, 4*a*.
melanitica.
var. *oxia* Bush, figs. 3, 3*a*.
oxylata Bush, fig. 1.
(?) *glypta* Bush, figs. 5, 5*a*.
Triforis turris-thomæ Dall, fig. 6.
Niso æglees Bush, figs. 10, 10*a*.
Actæon puncto-striatus Stimp., fig. 17.
Philine Sagra (D'Orb.), figs. 16, 16*a*.
Cylichna biplocata (Lea), fig. 14.
Bulla Candei D'Orb., fig. 13.
Dentalium leptum Bush, figs. 18, 18*a*.
Cadulus carolinensis Bush, fig. 19.
Neæra costata Bush, fig. 21.

ARTHUR P. CHADBOURNE. On a New Race of the Field Sparrow from Texas.

The Auk, III, April, 1886, pp. 248–249.

Refers to the type specimen of *Spizella wortheni* in the National Museum, which was compared with the form described.

A. HOWARD CLARK. History of the Iced-Fish and Frozen-Fish Trade of the United States.

Trans. Am. Fish. Soc., 1886, p. 68.

F. W. CLARKE. The relations of the Government to chemistry.

Bulletin of the Chemical Society of Washington, No. 1, pp. 9–22.

Annual address of the president of the Chemical Society of Washington, delivered December 10, 1885.

F. W. CLARKE. The minerals of Litchfield, Me.

Am. Journ. Sci., April, 1886, pp. 262–272.

Describes elæolite, cancrinite, and sodalite, with a new species, hydronephelite, and discusses formulæ. Two hundred separates printed.

F. W. CLARKE. Report of Chief Chemist.

Fifth Annual Report of the United States Geological Survey, 1883–'84 (1885), pp. 59–62.

J. M. CLARKE. On a higher Devonian Fauna of Ontario County, N. Y.

Bull. 16, *U. S. Geological Survey*, pp. 1–86; 3 plates.

JOSEPH W. COLLINS. Unusual abundance of cod on Brown's Banks.

Bull. U. S. Fish Com., v, Aug. 7, 1885, p. 234.

JOSEPH W. COLLINS. Fishing on an edge of the Grand Bank.

Bull. U. S. Fish Com., v, Aug. 12, 1885, p. 256.

JOSEPH W. COLLINS. Edible qualities of smoked king-fish (*Scomberomorus cavalla*) Cuv.

Bull. U. S. Fish Com., v, Sept. 15, 1885, p. 359.

JOSEPH W. COLLINS. Proposition to prepare king-fish by smoking.

Bull. U. S. Fish Com., v, Sept. 15, 1885, p. 360.

JOSEPH W. COLLINS. Report on the investigation of fishing grounds in the Gulf of Mexico, with notes on the fisheries of that region.

Report U. S. Fish Com., 1885, pp. 217–311, 10 plates.

CHARLES B. CORY. The birds of the West Indies, including the Bahama Islands, the Greater and the Lesser Antilles, excepting the islands of Tobago and Trinidad.

The Auk, III, Jan. and Apr., 1886, pp. 1–59 and 187–245.

To a great extent based on material in the National Museum.

WILLIAM VAN ZANDT COX. A Glance at Billingsgate.

Forest and Stream, XXV, 1, July 30, 1885, pp. 9–10.

Describes the methods of sale, etc., employed in this ancient and important fish-market.

WILLIAM HEALEY DALL. Notes on some Floridian land and fresh-water shells, with a revision of the *Auriculacea* of the Eastern United States.

Proc. U. S. Nat. Mus., VIII, July 13, 1885, pp. 255–289. Plates XVII–XVIII.

WILLIAM HEALEY DALL. On *Turbinella pyrum* Lamarck, and its dentition.

Proc. U. S. Nat. Mus., VIII, Sept. 2, 1888, pp. 345–348. Plate XIX.

Describes the soft parts of a mollusk, of which the shell has been known since Pliny, but of which the anatomy had hitherto remained unknown, and consequently a doubt had rested on the systematic position hitherto assigned to the species.

WILLIAM HEALEY DALL. Memorandum on the mounds of Satsuma and Enterprise, Fla.

Am. Journ. of Archæology, I, No. 2, July, 1885, pp. 184–189.

Contains an account of the structure of the mound and a list of the shells found within. The writer takes the position that the mound is in part artificial and intentional, and not the mere relic of innumerable dinners whose refuse was cast away without thought of mound-making.

WILLIAM HEALEY DALL. The teeth of Invertebrates.

Cyclopedia of Dentistry, I, 1886, pp. 337–350.

An illustrated article on the teeth of invertebrates in general, and especially of the *Echini* and mollusks, for the Cyclopedia of Dentistry, published by Lea Bros. & Co., and edited by Drs. Pierce, Leitch, and others.

WILLIAM HEALEY DALL. The National Government and Science.

The Evening Post, New York, Dec. 31, 1885.

Discusses the relations which should exist between scientific men and the organizations of the executive and legislative departments of the Government.

WILLIAM HEALEY DALL. *Neæra.*

Nature, XXXIV, No. 6, June 10, 1886, p. 122.

Calls attention to the absence of gills and other anatomical peculiarities of *Neæra* (*Cuspidaria*) and its subgenus *Myonera*.

WILLIAM HEALEY DALL. Work of the Challenger Expedition I. General and Physical. II. From a zoological stand-point.

Science, II, No. 126, July 3, 1885, pp. 15–16, and No. 128, July 17, 1885, pp. 54–56.

WILLIAM HEALEY DALL. Miocene deposits in Florida.

Science, VI, No. 130, July 31, 1885, p. 82.

Notes the occurrence of *Ecphora quadricostata* at Tampa and the probable large extent of so-called Miocene strata in Florida.

WILLIAM HEALEY DALL. West African Islands. (Review.)

Science, VI, No. 140, Oct. 9, 1885, pp. 306–307.

WILLIAM HEALEY DALL. Admiral Baron Ferdinand von Wrangell. (Review.)

Science, VI, No. 144, Nov. 6, 1885, pp. 417–418.

WILLIAM HEALEY DALL. The arms of the octopus or devil-fish.

Science, VI, No. 145, Nov. 13, 1885, p. 432.

Notes a specimen with a spread of arms of over 32 feet, taken at Unalashka, Aleutian Islands, in 1874.

WILLIAM HEALY DALL. Report of the Point Barrow Station. (Review.)

Science, VI, No. 146, Nov. 30, 1885, pp. 446–447.

WILLIAM HEALEY DALL. Shell-fish in Connecticut. (Review.)

Science, VII, No. 154, Jan. 15, 1886, pp. 59–60.

WILLIAM HEALEY DALL. Explorations in Alaska by the brothers Krause. (Review.)

Science, VII, No. 156, Jan. 29, 1886, pp. 95–96.

WILLIAM HEALEY DALL. Recent *Challenger* Reports. *Lamellibranchiata.* (Review.)

Science, VII, No. 162, March 12, 1886, p. 250.

WILLIAM HEALEY DALL. Bancroft's History of Alaska. (Review.)

Science, VII, No. 164, March 26, 1886, p. 292.

WILLIAM HEALEY DALL. Schwatka's Along Alaska's Great River. (Review.)

Science, VII, No. 165, April 2, 1886, p. 308.

Correction of erroneous statements in an anonymous review of Schwatka's work in a previous number (p. 294).

WILLIAM HEALEY DALL. Distribution of colors in the animal kingdom. (Review.)

Science, VII, No. 177, June 25, 1886, p. 572.

Correction of some erroneous assumptions in Camerano's work relating to the color of mollusks.

WILLIAM HEALEY DALL. Department of the Interior. | Bulletin | of the | United States | Geological Survey. | No. 24. | — | List of Marine Mollusks comprising the Quaternary Fossils and recent forms from American local- | ities between Cape Hatteras and Cape | Roque, including the Bermudas. | — | Washington: Government Printing Office. 1885.

8vo. pp. 1–336.

An index to the literature of the recent and quaternary mollusca of the region stated, preceded by a bibliography giving the full titles and dates of the journals and publications indexed. The indexing was done under the author's direction, and includes about twelve thousand eight hundred entries.

WILLIAM HEALEY DALL. Mollusks from near Point Barrow.

Report of the Expedition to Point Barrow, Alaska (1882–'83), pp. 177–184.

WILLIAM HEALEY DALL. The Native Tribes of Alaska. | An | Address | before the | Section of Authropology | of the | American Association for the Advancement of Science | at | Ann Arbor, August, 1885. | — | By | William H. Dall, | vice-president. | — | [From the Proceedings of the American Association for the Advancement | of Science, vol. XXXIV, Ann Arbor Meeting, August, 1885.] | Printed at the Salem Press. | Salem, Mass. | 1885.

8vo. pp. 1–19.

Also in *Proc. Am. Ass. Adv. Sci.*, XXXIV, August, 1885, pp. 363–379.

WILLIAM HEALEY DALL, CHARLES R. ORCUTT, and. Notes on the mollusks of the vicinity of San Diego, California, and Todos Santos Bay, Lower California, by Charles R. Orcutt; with comments by W. H. Dall.

Proc. U. S. Nat. Mus., VIII, Sept. 30, 1885, pp. 534–552. Plate XXIV.

This paper comprises a list by Mr. Orcutt of the species, with their stations, habits, etc., with systematic notes on various species, descriptions of *Lamellaria diegoënsis*, *Cœcum californicum* and *C. orcutti*, *Leptothyra* var. *lurida* and *Platidia* var. *radiata* Dall, with an account of the marsupium in the female *Mülneria minima* Dall, and the light which this discovery throws on the formation of the more specialized marsupium of *Thecalia concamerata* Adams.

FRED. P. DEWEY. The Copper Industry of the United States.

Chautauquan, VI, No. 2, 1885, pp. 95–98.

Gives a short account of the occurrences of copper, the methods of its extraction, and its most important uses.

FRED. P. DEWEY. Porosity and Specific Gravity of Flat Top Coke.

Virginias, VI, No. 10, 1885, p. 138.

Gives the results of an examination of the coke made in the Soldenhoff Coppée Ovens, at Hawk's Nest, Virginia, from the Blue Stone Coal of West Virginia.

FRED. P. DEWEY. Statement before the Select Committee of the Senate on Ordnance and War Ships.

Report of the Select Committee of the Senate on Ordnance and War Ships, pp. 268–280 of appendix.

Gives some general information as to the iron ores of the country with especial reference to their adaptability to making steel, and some special statements in regard to the steel-making iron ores of the South, giving many personal analyses.

CARL H. EIGENMANN. A review of the American Gasterosteidæ.

Proc. Ac. Nat. Sci. Phila., 1886, pp. 233–252.

BARTON W. EVERMANN.

See under Seth E. Meek.

WALTER FAXON. A list of the Astacidæ in the United States National Museum.

Proc. U. S. Nat. Mus., VIII, Sept. 2, 1885, pp. 356–361.

Contains the names of forty-seven species and varieties, all of which, excepting four, are from North America. The origin of each lot of specimens is stated, and the catalogue numbers under which they are registered are given.

J. WALTER FEWKES. On a collection of Medusæ made by the U. S. Fish Commission steamer *Albatross* in the Caribbean Sea and Gulf of Mexico.

Proc. U. S. Nat. Mus., VIII, Sept. 2 and 14, 1885, pp. 397–402, pl. XX.

"The greater part of this collection was made in the years 1884 and 1885. It contains no new species, but is interesting in a study of the geographical distribution of these animals, and is a supplement to a paper already prepared on the Medusæ of the Gulf Stream. Many of the genera and species here mentioned up to the present have not been recorded from the region of the Gulf Stream, but will probably be later taken from this locality."

Nine species are enumerated, with the localities in which they were taken, the two following being described:

	Page.
Cassiopea frondosa Lam	398
Abyla trigona Q. & G., pl. XX	399

J. WALTER FEWKES. List of *Medusæ* from near Point Barrow.

Report of the Expedition to Point Barrow, Alaska (1882–'83), pp. 163–165.

See also under John Murdoch. (Part IV, Natural History.)

F. LYNWOOD GARRISON. The microscopic structure of iron and steel.

Transactions Am. Institute Mining Engineers, 1885–'86, XIV, pp. 64–75. 10 figures.

Description of photographs of microscopic sections of iron and steel, copies of which have been presented to the Museum.

THEODORE N. GILL. The chief characteristics of the North American fish fauna.

Forest and Stream, XXV, No. 8, Sept. 17, 1885, p. 149; also in *Trans. Am. Fish. Soc.*, 1885, p. 69.

F. DU CANE GODMAN and O. SALVIN. *Biologia Centrali-Americana, Aves.* Vol. I, pp. 345–392.

Three parts relating to ornithology were issued during the year 1885–'86, treating of a part of the *Fringillidæ*. References to Museum specimens are very frequent throughout this great and important work, which is being issued in parts, and is not yet completed.

G. BROWN GOODE. A brief biography of the Halibut.

American Naturalist, XIX, No. 10, Oct. 1885, pp. 953–969. Also as a separate

G. BROWN GOODE. The Beginnings | of | Natural History | in | America. | — | An address delivered at the Sixth Anniversary meeting of the Biological Society | of Washington. | — | By | G. Brown Goode, | President of the Society. | — | From the proceedings of the Biological Society of Washington, Volume III, 1884–1886. | — | Washington: | Printed for the Society. | 1886.

8vo. pp. 35–105.

A discussion of the work of the earliest naturalists and explorers, and of the origin of scientific institutions in America.

G. BROWN GOODE. The care of pamphlets.

Science, VI, Oct. 16, 1885, No. 141, p. 337. Abstract in *Bull. Phil. Soc.*, 1885, p. 29.

G. BROWN GOODE and TARLETON H. BEAN. Description of *Leptophidium cerrinum* and *L. marmoratum*, new fishes from deep water off the Atlantic and Gulf coasts.

Proc. U. S. Nat. Mus., VIII, Sept. 17, 1885, pp. 422–424.

G. BROWN GOODE and TARLETON H. BEAN. Descriptions of new fishes obtained by the U. S. Fish Commission, mainly from deep water off the Atlantic and Gulf coasts.

Proc. U. S. Nat. Mus., VIII, Oct. 19 and 20, 1885, p. 589.

Aphoristia diomedeana, *A. pusilla*, *Hemirhombus fimbriatus*, *Citharichthys ventralis*, *Etropus rimosus*, *Macrurus caribbæus*, *M. occa*, *Coryphænoides sulcatus*, *Malacocephalus occidentalis*, *Bathygadus cavernosus*, *B. macrops*, *B. longifilis*, nn. ss.; *Neobythites*, *Porogadus*, nn. gg.; *Neobythites gilli*, *Porogadus miles*, nn. ss.; *Bathyonus*, nom. g. n.; *Bathyonus catena*, *B. pectoralis*, nn. ss.

ASA GRAY. Plants from near Point Barrow.

Report of the expedition to Point Barrow, Alaska (1882–'83), [1885] pp. 191–192.

See under John Murdoch. (Part IV, Natural History.)

F. H. H. GUILLEMARD. Report on the Collections of Birds made during the voyage of the yacht *Marchesa*. I. A provisional list of the birds inhabiting the Sulu Archipelago.

Proc. Zool. Soc. of London, 1885, pp. 247–275.

A specimen of *Carpophaga pickeringi* was compared with the type in the National Museum at the author's request, and the result of Mr. Ridgway's comparison is given on page 270.

V. HAVARD. Report on the Flora of Western and Southern Texas.

Proc. U. S. Nat. Mus. VIII, Sept. 23, 28, and 30, 1885, pp. 449–533.

In the first part of this report a general description of the vegetation of western and southern Texas is given, the second part being made up of economic notes on the plants known to have useful or baneful properties or to be of value to agriculture or industry. The specimens treated of in this report have been presented to the National Museum.

O. P. HAY. Notes on a collection from Florida, with descriptions of new or little-known species.

Proc. U. S. Nat. Mus., VIII, Sept. 30, 1885, p. 552.

Etheostoma davisoni, *Zygonectes auro guttatus*, nn. ss.

H. W. HENSHAW.—The Gulls of the Californian Coast.

The Auk, II, July, 1885, pp. 231, 232.

ROMYN HITCHCOCK [Editor]. The American Monthly Microscopical Journal.

Current numbers, VI, July, 1885, to VII, June, 1886 (incl.), Nos. 67–78.

A journal devoted to the interests of practical microscopists, containing information concerning methods of work, formulæ, notes, etc., with contributed articles and reviews.

ROMYN HITCHCOCK. Provisional Key to the Classification of *Algæ* of Fresh Water.

The Am. Monthly Micr. Journ., VI, July, 1885, pp. 129–130; Sept., 1885, pp. 170–174; Dec., 1885, pp. 231–233; VII, Feb., 1886, pp. 30–31; Mar., 1886, pp. 50–53; May, 1886, pp. 95–97.

A series of continued articles.

ROMYN HITCHCOCK. Studies of *Amœbæ*. (Abstract.)
The Am. Monthly Micr. Journ., VI, July, 1885, pp. 135–136.

ROMYN HITCHCOCK. Manipulations of the Microscope. (Review.)
The Am. Monthly Micr. Journ., VI, July, 1885, p. 140.

ROMYN HITCHCOCK. Conjugation of *Rhabdonema*. (Abstract.)
The Am. Monthly Micr. Journ., VI, Aug., 1885, pp. 151–152.

ROMYN HITCHCOCK. Microscopical Exhibitions.
The Am. Monthly Micr. Journ., VI, Aug., 1885, pp. 158–159.

ROMYN HITCHCOCK. Optical Arrangements for Photo-micrography and Remarks on Magnification.
The Am. Monthly Micr. Journ., VI, Sept., 1885, pp. 168–170.
Also an abstract in *Proc. Am. Ass. Adv. Sci.*, XXXIV, Aug., 1885, pp. 356–359.
Read (by Dr. H. G. Beyer) at the meeting of the A. A. A. S., Ann Arbor, 1885.

ROMYN HITCHCOCK. Poisonous Dried Beef.
The Am. Monthly Micr. Journ., VI, Sept., 1885, pp. 176–177.

ROMYN HITCHCOCK. Testing objectives.
The Am. Monthly Micr. Journ., VI, Sept., 1885, pp. 177–178.

ROMYN HITCHCOCK. Photo-micrography.
The Am. Monthly Micr. Journ., VI, Nov., 1885, pp. 201–203; Dec., 1885, pp. 224–227; VII, Jan. 1886, pp. 5–10; Mar., 1886, pp. 48–50; Apr., 1886, pp. 67–70; May, 1886, pp. 92–95.
A series of continued articles.

ROMYN HITCHCOCK. The Red Snow.
The Am. Monthly Micr. Journ., VI, Dec., 1885, pp. 221–224.
Read before the Biological Society of Washington December 12, 1885.

ROMYN HITCHCOCK. Fixing Arranged Diatoms and Sections.
The Am. Monthly Micr. Journ., VI, Dec., 1885, p. 233.

ROMYN HITCHCOCK. The Striæ of Diatoms on the Möller Probe-Platte.
The Am. Monthly Micr. Journ., VI, Dec., 1885, p. 234.

ROMYN HITCHCOCK. Microscopical Societies.
The Am. Monthly Micr. Journ., VI, Dec., 1885, pp. 237–239.

ROMYN HITCHCOCK. A New Mounting Medium of High Refractive Index.
The Am. Monthly Micr. Journ., VII, Jan., 1886, pp. 3–4.

ROMYN HITCHCOCK. Note on the Spencer-Harrison controversy.
The Am. Monthly Micr. Journ., VII, Jan., 1886, pp. 18–19.

ROMYN HITCHCOCK. Note on Dr. T. B. Redding's article: "The Molecular Theory of Sound" in the Physio-Medical Journal.
The Am. Monthly Micr. Journ., VII, Feb., 1886, p. 38.

ROMYN HITCHCOCK. The limits of resolution. (Abstract.)
The Am. Monthly Micr. Journ., VII, Feb., 1886, pp. 35–36.

ROMYN HITCHCOCK. Mounting Media.
The Am. Monthly Micr. Journ., VII, Apr., 1886, p. 74.

ROMYN HITCHCOCK. Investigation of Microbes.
The Am. Monthly Micr. Journ., VII, Apr., 1886, pp. 74–76.

E. B. HODGE. The trout of Sunapee Lake.
Forest and Stream, XXVI, 7, Mar. 11, 1886, p. 129.

E. B. HODGE. The Sunapee trout.
Forest and Stream, XXVI, 10, Apr. 1, 1886, p. 185.

JACOB R. HUTCHINSON. The trout of Sunapee Lake.
Forest and Stream, XXVI. 18, Apr. 22, 1886, p. 247.

DAVID S. JORDAN. Channel Catfish, *Ictalurus punctatus*. Rafinesque.
Forest and Stream, XXV, 1, July 30, 1885, p. 9.

DAVID S. JORDAN. Notes on fishes observed in Lake Superior.
Bull. U. Fish Com., Aug. 11, 1885, pp. 191–192.

DAVID S. JORDAN. A list of the fishes known from the Pacific coast of Tropical America, from the Tropic of Cancer to Panama.
Proc. U. S. Nat. Mus., VIII, Sept. 2, 1885, p. 361.

DAVID S. JORDAN. Note on some Linnæan names of American fishes.
Proc. U. S. Nat. Mus., VIII, Sept. 2, 1885, p. 394.

J. H. KIDDER. Memorandum on water residues from cod-hatching station at Wood's Holl.
Bull. U. S. Fish Com., V, Sept. 15, 1885, p. 357.

GEORGE F. KUNZ. The gems of the National Museum.
The Popular Science Monthly, XXVIII, 168, April, 1886, pp. 823–830.
Published also as a separate. Revised and extended by W. S. Yeates in Part III, of this report.

GEORGE N. LAWRENCE. A list of a few species of birds new to the fauna of Guadeloupe, West Indies, with a description of a new species of *Ceryle*.
Proc. U. S. Nat. Mus., VIII, Nov. 3 and Dec. 7, 1885, pp. 621–625.
Female type of *Ceryle stictipennis* sp. nov. in the National Museum.

GEORGE N. LAWRENCE. Descriptions of new species of birds of the family Columbidæ.
The Auk, II, Oct., 1885, pp. 357–359.
Zenaida rubripes sp. nov., described from type in the National Museum.

GEORGE N. LAWRENCE. Characters of two supposed new species of birds from Yucatan.
Annals New York Acad. Sci., III, No. 9, pp. 273–274.
Polioptila albiventris and *Chætura peregrinator*.

FREDERIC A. LUCAS. Notes on the preparation of rough skeletons.
Proc. U. S. Nat. Mus., VIII, 1885, pp. 679–686.
Printed also as Circular 33, U. S. Nat. Museum.

JOHN BELKNAP MARCOU. A list of the Mesozoic and Cenozoic types in the collections of the U. S. National Museum.
Proc. U. S. Nat. Mus., VIII, Aug. 6 and 7 and Sept. 2, 1885, pp. 290–344.

JOHN BELKNAP MARCOU. Department of the Interior: | U. S. National Museum. | — | Bulletin | of the | United States National Museum. | No. 30. | Bibliographies of American Naturalists. | III.* Publications relating to fossil invertebrates. | By | John Belknap Marcou. | — | Washington: | Government Printing Office. | 1885.
8vo. pp. 1–333.

JOHN BELKNAP MARCOU. A review of the progress of North American invertebrate palæontology for 1884.
Smithsonian Report for 1884 (1885), pp. 563–582.

OTIS T. MASON. The use of the throwing-stick by Eskimo.
Forest and Stream, XXV, 6, Sept. 3, 1885, pp. 109–110.

OTIS T. MASON. The Chaclacayo trephined skull.
Proc. U. S. Nat. Mus., VIII, Sept. 14, 1885, pp. 410–412. One plate.

OTIS T. MASON. Anthropology.
Smithsonian Report for 1884 (1885), pp. 677–717.

OTIS T. MASON. The Guesde collection of antiquities in Pointe-à-Pitre, Guadaloupe, West Indies.
Smithsonian Report, 1884 (1885), pp. 731–837. 215 figs.

OTIS T. MASON. Anthropological notes.
American Naturalist, Vol. XIX, 7–12, 1885.

Metallurgy among savages, p. 729. The Frankfort craniometric agreement, p. 730. Ethnography of Guatemala, p. 731. Mortality in Washington, p. 826. The Davenport elephant pipes, p. 827. Anthropological publications, p. 912. The Fuegians, p. 915. The eighth volume of the Tenth Census, p. 1018. Anthropological collectors, p. 1019. Pilling's Bibliography, p. 1129. The Mound Builders and the Historic Indians, p. 1130. The natives of New Guinea, p. 1131. Dr. Rau's prehistoric fishing, p. 1243.

American Naturalist, Vol. XX, 1–6, 1886.

Stone implements, p. 85. Polynesia, p. 86. The Anthropological Society of Washington, p. 195. Ethnology of Borneo, p. 196. The Eskimo at Point Barrow, p. 197. The blow tube in the

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* Parts I and II already published.

OTIS T. MASON. Anthropological notes—Continued.

United States, p. 198. Physical education of children, p. 199. Annual Report of the Bureau of Ethnology, p. 309. The crania of the negroes, p. 312. Maori Pharmacopia, p. 401. The Laplanders, p. 402. Relationships between the Eskimo tribes, p. 403. Archæological maps, p. 404. The races of man, p. 404. The so-called deformed crania, pp. 481–487. Corea, p. 569. The relation of anthropology to the science of mind, p. 570. Jewish ability, p. 572. Aboriginal baking-pans, p. 473. War-clubs and digging-sticks, p. 574.

FRED MATHER. A new native trout.

Forest and Stream, XXV, 25, Jan. 14, 1886, p. 481.

Salvelinus oquassa from Sunapee Lake, New Hampshire.

FRED MATHER (*editor*). Sunapee trout.

Forest and Stream, XXVI, 9, Mar. 25, 1886, p. 169.

SETH E. MEEK and BARTON W. EVERMANN. A review of the American species of the genus *Gerres*.

Proc. Ac. Nat. Sci. Phila., 1886, pp. 233–252.

C. HART MERRIAM. Description of a new subspecies of the common eastern chipmunk.

Amer. Nat., XX, No. 3, March, 1886, pp. 236–242 (also as a separate).

C. HART MERRIAM. Description of a new species of Aplodontia, from California.

Annals of the New York Acad. Sci., III, No. 10, May, 1886, pp. 312–328, plates XIX–XX.

Read March 15, 1886.

(Also as a separate, May, 1886.)

GEORGE P. MERRILL. Notes on the mineralogy and lithology of the District of Columbia.

Proc. U. S. Nat. Mus., VIII, Sept. 2, 1885, pp. 351–353.

A brief description of the minerals found in the water-works tunnel of this city, and which had not before been recognized from this locality. Nine species are described.

GEORGE P. MERRILL. Building and ornamental stones of the United States.

The Popular Science Monthly, XXVIII, 160, Aug., 1885, pp. 520–532.

A brief notice of the various kinds and amounts of stone quarries for building and ornamental purposes in the United States.

JOHN MURDOCH. (Part IV, Natural History.)

Report of the Expedition to Point Barrow, Alaska, 1882–'83, pp. 89–200. Five plates.

This report on the natural history of the Point Barrow Expedition (1882–'83) gives the results of the work of the author as naturalist of the expedition and of others associated with him, and consists of the following divisions:

I. Mammals, pp. 92–103.
II. Birds, pp. 104–128. Plates, 2.
III. Fishes, pp. 129–132.
IV. Insects, pp. 133–135.
V. Marine invertebrates, exclusive of molluska, pp. 136–176. Plates, 2.
VI. Molluska, pp. 177–194. One plate.
VII. Collecting localities and dredging stations, pp. 185–190.
VIII. Plants, pp. 191–192.
Appendix, pp. 193–200.

Parts I, II, III, VII, the introduction and the appendix, the introduction to IV (p. 133), and all of V except pp. 163–165, were written by Mr. Murdoch; the remainder of Part IV (pp. 134–135) was written by Prof. C. V. Riley; the remainder of Part V, list of medusæ from near Point Barrow (pp. 163–165), by Mr. J. Walter Fewkes; Part VI, by Mr. W. H. Dall, and Part VII, by Prof. Asa Gray.

JOHN MURDOCH. Insect-collecting at Point Barrow, Arctic Alaska. (Abstract.)

Proc. Ent. Soc., of Washington, February 29, 1884, to December 3, 1885, I, No. 1, 1886, pp. 9–10.

Abstract of paper read before the Ent. Soc. of Washington, April 3, 1884.

WILLARD NYE, jr. Notes on octopus, flying-fish, etc., taken during the *Albatross* cruise in January, 1884.

Bull. U. S. Fish Com., V, pp. 189–190.

CHARLES R. ORCUTT and WILLIAM HEALEY DALL. Notes on the mollusks of the vicinity of San Diego, Cal., and Todos Santos Bay, Lower California, by Charles R. Orcutt, with comments by W. H. Dall.

Proc. U. S. Nat. Mus., VIII, Sept. 30, 1885, pp. 534–552, plate XXIV.

This paper comprises a list of the species, with their stations, habits, etc., by Mr. Orcutt, with systematic notes on various species, descriptions of *Lamellaria diegoënsis*, *Caecum californicum* and *C. orcutti*, *Leptothyra* var. *lurida* and *Platidia* var. *radiata* Dall, with an account of the marsupium in the female *Milneria minima* Dall, and the light which this discovery throws on the formation of the more specialized marsupium of *Thecalia concamerata* Adams.

See under William Healey Dall.

WILLIAM PALMER. Occurrence of *Helminthophila leucobronchialis* in Virginia.

The Auk, II, July 1885, p. 304.

Announces the capture of this species near Fort Myer. The specimen was presented to the Museum by the author.

EMORY D. POTTER. The Pike family.

Forest and Stream, XXV, No. 9, Sept. 24, 1885, p. 168.

EDWARD POTTS. Fresh-water Sponges from Mexico.

Proc. U. S. Nat. Mus., VIII, Oct. 19, 1885, pp. 587–589. One figure.

Description of *Myenia plumosa* Carter, var. *Palmieri* Potts. Obtained by Dr. Edward Palmer along the banks of the Colorado River, near Terdo, Sonora, in northwestern Mexico. The specimens are preserved in the National Museum.

JOHN D. QUACKENBOS. The new trout of Sunapee Lake.

Forest and Stream, XXV, No. 8, Mar. 18, 1886, p. 149.

JOHN D. QUACKENBOS. The trout of Sunapee Lake.

Forest and Stream, XXVI, No. 13, Apr. 22, 1886, p. 247.

RICHARD RATHBUN. An edible clam introduced on the Atlantic coast.

Science, VI, No. 128, July 17, 1885, p. 53.

Notice of the planting at the Wood's Holl station of the U. S. Fish Commission of eight hundred living specimens of *Tapes staminea*, known as the "little round clam," obtained at Henderson's Bay, Puget Sound, near Tacoma, Washington Territory.

RICHARD RATHBUN. A crab invasion.

Science, VI, No. 131, Aug. 14, 1885, p. 135.

Notice of the sudden appearance, on the sea-shore, at Cape San Antonio, western Cuba, of countless myriads of young Grapsoid crabs, probably belonging to the genus Sesarma.

RICHARD RATHBUN. Report upon the Echini collected by the U. S. Fish Commission steamer *Albatross* in the Gulf of Mexico, from January to March, 1885.

Proc. U. S. Nat. Mus., VIII, Nov. 3, 1885, pp. 606–620.

Contains a "Notice of the Cruise of 1885," "List of the stations at which Echini were collected in 1885," "Account of the species of Echini obtained in 1885," and "Lists of the species obtained in 1884 and 1885, arranged according to localities." Brief notes are given with many of the species. The number of species collected in 1885 was thirty-one, the total number for 1884 and 1885 combined, forty. These were obtained in various depths from the littoral zone to to 1,639 fathoms.

RICHARD RATHBUN. Notice of a collection of Stalked Crinoids made by the steamer *Albatross* in the Gulf of Mexico and Caribbean Sea, 1884 and 1885.

Proc. U. S. Nat. Mus., VIII, Dec. 7, 1885, pp. 628–635.

Four species are recorded: *Rhizocrinus Rawsoni*, *Pentacrinus decorus*, *P. Mulleri*, and *P. asterius*. A few notes are given respecting each of the species, a few variations are described, and lists are given of all the specimens collected.

RICHARD RATHBUN. Notes on Lobster Culture.

Bull. U. S. Fish Com., VI, Feb. 8, 1886, pp. 17–32.

Contains an account of the experiments made at the Wood's Holl station of the U. S. Fish Commission during the summer of 1885, to ascertain the best method of handling lobster eggs for the purposes of artificial lobster-culture. The following topics are also discussed: "Necessity of attempting the artificial propagation of lobsters," "Range and migrations of lobsters," "Spawning season and habits, developments, and rate of growth," "Experiments previously made in lobster-culture," "Transplanting of lobsters."

ROBERT RIDGWAY. A Review of the American Golden Warblers.

Proc. U. S. Nat. Mus., VIII, Sept. 2, 1885, pp. 348–350.

A synoptical table is given of the known species and subspecies, of which two are described as new, viz: *Dendroica petechia rufivertex*, from Cozumel, Yucatan, and *D. bryanti castaneiceps*, from Lower California.

ROBERT RIDGWAY. Some Emended Names of North American Birds.

Proc. U. S. Nat. Mus., VIII, Sept. 2, 1885, pp. 354–356.

A list of names which require emendation from the stand-point of the new code of nomenclature adopted by the American Ornithologists' Union, and here published "in order that the first known use" of the combinations of generic and specific names adopted "may be cited among the references which the committee [having charge of the preparation of the list] has decided to give under each species."

ROBERT RIDGWAY. Description of an apparently new species of *Dromococcyx* from British Guiana.

Proc. U. S. Nat. Mus., VIII, Sept. 3, 1885, p. 559.

Dromococcyx gracilis, sp. nov.

ROBERT RIDGWAY. Catalogue of a Collection of Birds made on the Island of Cozumel, Yucatan, by the Naturalists of the U. S. Fish Commission steamer *Albatross*, Capt. Z. L. Tanner, commander.

Proc. U. S. Nat. Mus., VIII, Sept. 30, Oct. 17 and Oct. 19, 1885, pp. 560–583.

A full report upon the collection made by the naturalists of the *Albatross* during their visit to Cozumel, January 22 to 29, 1885. It comprises four hundred and twenty-nine specimens representing fifty-seven species, but the report also includes six other species known to inhabit the island. In addition to the new species previously described, a new species of Woodpecker is characterized, viz: *Centurus rubriventris pygmæus*. A faunal summary in tabular form, showing the complicated relationships of the Cozumel bird fauna, concludes the article.

ROBERT RIDGWAY. Description of a new Cardinal Grosbeak from Arizona.

The Auk, II, Oct., 1885, pp. 343–345.

Cardinalis cardinalis superbus.

Subsp. nov. Type, No. 98942, U. S. Nat. Mus.

ROBERT RIDGWAY. *Helminthophila leucobronchialis.*

The Auk, II, Oct. 1885, pp. 359–363.

Explains the non-typical specimens of the bird in question by assuming *H. leucobronchialis typicus* to be a valid species and not a hybrid, but extensively hybridizing with its allies.

ROBERT RIDGWAY. On *Junco cinereus* Swains., and its geographical races.

The Auk, II, Oct., 1885, pp. 363–364.

Characterizes three forms and describes as new *J. cinereus palliatus*, from southern Arizona. Type, No. 68817, U. S. Nat. Mus.

ROBERT RIDGWAY. A New Petrel for North America.

The Auk, II, Oct., 1885, pp. 386–387.

Pelagodroma marina (Lath.).

Captured on board the U. S. Fish Commission steamer *Albatross* in latitude 40° 34′ 18″ north, 66° 09′ west longitude.

ROBERT RIDGWAY. On the proper name for the Prairie Hen.

The Auk, III, Jan., 1886, pp. 132–133.

Thinks that it should stand as *Tympanuchus americanus* (Reichenb.).

ROBERT RIDGWAY. The Scissor-tailed Flycatcher, *Milvulus forficatus*, at Key West.

The Auk, III, 1886, Jan., p. 134.

U. S. Nat. Mus. No. 102444, collected by the naturalists of the Fish Commission steamer *Albatross*.

ROBERT RIDGWAY. The vernacular name of *Plectrophenax hyperboreus.*

The Auk, III, Jan., 1886, p. 135.

Proposes to retain the name originally given to it, viz, "McKay's Snowflake."

ROBERT RIDGWAY. Water birds of North America. A Few Corrections Rectified.

The Auk, III, April, 1886, pp. 266–268.

A reply to a paper by Dr. J. G. Cooper in a previous number of *The Auk*.

ROBERT RIDGWAY. *Tringa damacensis* (Horsf.) in Alaska, a Sandpiper new to the North American Fauna.

The Auk, III, April, 1886, p. 275.

ROBERT RIDGWAY. Discovery of the Breeding Place of McKay's Snowflake, *Plectrophenax hyperboreus*.

The Auk, III, April, 1886, pp. 276, 277.

The species was found breeding on Hall Island, Bering Sea, by Mr. Charles H. Townsend.

ROBERT RIDGWAY. On two Abnormally-colored Specimens of the Bluebird: *Sialia sialis*.

The Auk, III, April, 1886, pp. 282, 283.

Both in the National Museum. One has the blue color pervading part of the lower surface; the other has the blue of the back the same shade as *S. azurea*.

ROBERT RIDGWAY. The Fish Commission Steamer *Albatross*, etc.

The Auk, III, April, 1886, pp. 286, 287.

Note in reference to the departure of the *Albatross* and proposed work of the naturalists accompanying the vessel.

ROBERT RIDGWAY. Arizona Quail.

Forest and Stream, XXV, 25, Jan. 14, 1886, p. 484.

A reply to Herbert Brown's article in a previous number in regard to *Colinus ridgwayi* and *C. graysoni*, with a "key" to the characters of the species mentioned, and of *C. virginianus texanus*. (*See* under Brown, Herbert).

ROBERT RIDGWAY. [Is the Dodo an Extinct Bird?]

Science, VII, No. 160, Feb. 26, 1886, p. 190.

A reply to Dr. R. W. Shufeldt's question in a previous number showing that the supposed Dodo in the Samoan Islands is only *Didunculus strigirostris*.

ROBERT RIDGWAY. Letter to Dr. B. H. Warren, in reply to inquiries concerning the food habits of Hawks and Owls.

Daily Local News (West Chester, Pa.), March 5, 1886.

Reprinted in *Forest and Stream*, XXVI, 9, March 25, 1886, p. 164.

Section 1, page 141 of the Laws of Pennsylvania for 1885 offers a bounty for the destruction of hawks and owls. The Microscopical Society of West Chester in their endeavor to have the act repealed asked the opinion of several ornithologists, the author replying that he regards the majority of hawks and owls as "very decidedly beneficial to man."

CHARLES V. RILEY. Report of the Entomologist, Charles V. Riley, M. A., Ph. D., for 1885.

Report of the Department of Agriculture, 1885: pp. 7—1, 137, 8—2, 1 map, 9 plates.

Separate author's ed. of "Report of the Entomologist" by Entomologist of (United States) Department of Agriculture, 1885; Report (United States) Commissioner of Agriculture for 1885, pp. 207–343, pp. 1, 2, map 1, pp. 1–9, with addition of t. p. cover, t. p. (p. 1), table of contents (pp. 3–7), corrigenda (p. 1), general index (pp. 1–6), and plant index (pp. 7, 8).

Contains divisions and sub-chapters, with the titles given below: Introduction, pp. 207–213; silk culture, pp. 214–228, pls. 2–4; miscellaneous insects, pp. 228, 289, map 1, pls. 1, 5–8; destructive locusts or "grasshoppers," pp. 228–233, pl. 8; the periodical Cicada (*Cicada septendecim* L. and race *tredecim* Riley), pp. 233–258, map 1, pls. 1, 5, 6, fig. 1; the Leather beetle or toothed Dermestes (*Dermestes vulpinus*, Fabr.), pp. 258–264, pl. 6, fig. 2; the Garden web-worm (*Eurycreon rantalis*, Guen.), pp. 265–270, pl. 6, fig. 3; the Dark-sided cut-worm (larva of *Agrotis messoria*, Harr.), pp. 270–275, pl. 7. fig. 1; the strawberry weevil (*Anthonomus musculus* Say), pp. 270–282, pl. 7, figs. 5, 6; the pear midge or pear diplosis (*Diplosis nigra* (?), Meigen), pp. 283–289, pl. 7, figs. 2, 3, 4; reports of agents, pp. 289–343, pl. 9; D. W. Coquillett, report on the locusts of the San Joaquin Valley, California, pp. 289–303; Lawrence Bruner, report on the abundance of the Rocky Mountain locust in 1885, pp. 303–307; Albert Koebele, notes on locusts at and about Folsom, Cal., pp. 308–311; F. M. Webster, insects affecting fall wheat, pp. 311–319; Dr. A. S. Packard, special agent, third report on the causes of destruction of the evergreen and other forest trees in northern New England, pp. 319–333, pl. 9; Nelson W. McLain, report on experiments in apiculture, pp. 333–343.

CHARLES V. RILEY.—Silk culture.

Report of the Entomologist, Department of Agriculture, 1885: pp. 214–228 (8–22); plates 2–4.

General work of the Entomological Division in developing silk culture; distribution of mulberry trees and silk-worm eggs; home-raised *vs.* imported eggs; establishing of filatures; cost of producing reeled silk; work on the Pacific coast; precautions necessary in the production of pure silk-worm eggs and in properly wintering them; diseases of the silk-worm—flaccidity,

CHARLES V. RILEY. Silk culture—Continued.

pébrine; wintering the eggs; figs. of silk-worms showing effect of flaccidity, anatomy of silk-worm, silk-worms with pebrinous spots, chain ferment of flaccidity, corpuscules of pébrine, cell for egg-laying, method of clamping bags, constricted cocoon of fine texture, non-constricted cocoon of coarse texture.

The article, taken from advance sheets from the fourth report U. S. Entomological Commission, discusses the question of the nomenclature of the Noctuid, popularly known as the Cotton-worm moth. From a study of Huebner's figures and description, and an inspection of the Sommer collection in Dresden, the conclusion is reached that Huebner's specific name, *argillacea*, must be rejected and Say's name, *xylina*, retained.

CHARLES V. RILEY. Notes on the Principal Injurious Insects of the year.

Entomologica Americana, I, No. 9, 1885, pp. 176, 177.

The paper was read before the entomological club of the Am. Ass. Adv. Sci., Ann Arbor meeting, August, 1885, and mentions the appearance, in destructive numbers, of the following insects: *Pulvinaria innumerabilis*, *Agrotis fennica*, *A. messoria*, *Anthonomus musculus*, *Eurycreon rantalis*, *Cicada septendecim*, *Cecidomyia destructor*, *Melanoplus devastator*, *M. spretus*, and *Camnula pellucida*.

CHARLES V. RILEY. The Imported Elm-leaf beetle.

Harper's Weekly, XXIX, July 18, 1885, p. 463.

A critical review of the publications on the parasites of the Hessian Fly, and detailed descriptions, with figures and biological notes, of the following species of Chalcididæ which have been bred from the larvæ or pupæ of *Cecidomyia destructor*: *Merisus destructor* (Say), male and female, pl. 23, fig. 1; *Merisus* (*Homoporus*) *subapterus*, n. sp., male and female, pl. 23, fig. 2; *Tetrastichus productus*, n. sp., male and female, pl. 23, fig. 5. *Eupelmus allynii* (French) is proven to be a parasite of the Hessian fly and both sexes figured (pl. 23, figs. 3, 4). Criticism of Cook's and Packard's observations on *Platygaster error* Fitch (? Packard) and figure of the male (pl. 23, fig. 6).

CHARLES V. RILEY. Destructive insects of the year.

Rural New Yorker, XLIV, July 11, 1885, p. 464.

Discusses the following species of insects which did much injury during the year 1885: The Onion Cut-worm (larva of *Agrotis messoria*) in Orange County, N. Y., mode of its work on young onion plants, reference to remedies; the strawberry weevil (*Anthonomus musculus*) on Staten Island and in Michigan, nature of injury done; larva of *Eurycreon rantalis*, enumeration of localities and crops most suffering from it.

CHARLES V. RILEY. Pests of the Strawberry.

Rural New Yorker, XLIV, July 18, 1885, p. 484.

Reply to letter of J. H. J., Jackson, Kans., and determination of the following strawberry insects: Larva of *Agrotis tricosa*; larva of either *Phoxopteris fragariæ* or *Ecdopsis permundana*; larva of *Emphytus maculatus*; gives the most available remedy for each of these pests.

CHARLES V. RILEY. The Clyclone Nozzle.

Rural New Yorker, XLIV, Aug. 22, 1885, p. 567.

The cyclone nozzle can not be justly said to be invented by any one individual; it is a development of one of the practical outgrowths of the writer's work for the Government.

CHARLES V. RILEY. A new Remedy against the Destructive Locust.

Rural New Yorker, XLIV, Aug. 29, 1885, p. 577.

Describes the method successfully used in California for destroying locusts by using baits consisting of arsenic, bran, sugar, and water.

CHARLES V. RILEY. Enemies of the Black Walnut and Willow.

Rural New Yorker, XLIV, Sept. 19, 1885, p. 632.

Reply to a letter regarding a caterpillar as injurious to walnut, and another species as injurious to willow. The former is the larva of *Datana ministra*, the latter the larva of *Cimbex americana*. Gives a summary of the natural history of both insects as well as directions for their destruction.

CHARLES V. RILEY. The Mildews of the Grape-vine. An effectual remedy for Peronospora.

Rural New Yorker, XLV, Jan. 16 and Feb. 6, 1886, pp. 72 and 87. Two illustrations. (Also author's separate, one folio sheet).

The development and structure of the two most important fungi attacking the grape-vine, viz, the Powdery grape-vine mildew (*Uncinula spiralis*) and the Downy grape-vine mildew (*Peronospora viticola*) are treated of, with a full discussion of the remedies and prophylactics.

CHARLES V. RILEY. Premature appearance of the Periodical Cicada.

Science, VI, No. 126, July 3, 1885, pp. 3, 4.

Reply to Prof. Lester F. Ward's com munication to Science (vol. v, p. 476); reasons for rejecting Professor Ward's testimony regarding a supposed appearance of the *Cicada septendecim* in October.

CHARLES V. RILEY. Periodical Cicada in Massachusetts.

Science, VI, No. 126, July 3, 1885, p. 4.

Request for information regarding the presence or absence of the *septendecim* brood of the Periodical Cicada of the year 1885 in southeastern Massachusetts.

CHARLES V. RILEY. The Song-notes of the Periodical Cicada.

Science, VI, No. 138, Sept. 25, 1885. Also as a reprint in *The Kansas City Review* IX, Oct., 1885, pp. 173–175.

With an additional paragraph on the mechanism of the stridulatory organs in the *Cicada septendecim*.

Also as an abstract in *Proc. Am. Ass. Adv. Sci.*, XXXIV, Aug., 1885, pp. 330–332. (Ann Arbor meeting).

Author's separate copies published May, 1886.

Description of the prevalent notes of the noise produced by the *Cicada septendecim* L.: First the phar-r-r-r-r-oah note, most often heard during the early maturity of the male; secondly, the "screech," the prevailing note in the height of the season; thirdly, the "intermittent, chirping" sound.

CHARLES V. RILEY. A carnivorous Butterfly larva.

Science, VII, No. 169, April 30, 1886, p. 394. Also in *Am. Nat.*, XX, No. 6, June, 1886, pp. 556–557.

Abstract of paper read before the Biological Society of Washington, February 20, 1886.

Gives a summary of the previous records of the food-plants of *Feniseca tarquinius*, and proves from observations made by Theo. Pergande that the larva feeds upon different species of plant-lice (Aphididæ).

CHARLES V. RILEY. Annual address, as president of the Entomological Society of Washington.

Proc. Ent. Soc. of Washington: I, No. 1, pp. 17–27.

CHARLES V. RILEY. Abstracts of remarks made before the Entomological Society of Washington, and published in its Proceedings.

Proc. Ent. Soc. of Washington: I No. 1 (February 29, 1884, to December 3, 1885), 1886.

The following are the titles:

On the phytophagic habits of the genus *Isosoma*, p. 15.

Description of a new species of *Acrobasis* (*A. vaccinii*), known in the larva state as "the Cranberry fruit worm," p. 15.

Criticism on a report in *Psyche* regarding the habit of *Tiphia* and *Rhipiphorus*, p. 15.

On the larva of Dipterous genus *Scenopinus*, p. 17.

Observations on the Periodical Cicada, pp. 29–30.

On food-habits of *Walshia amorphella*, and on the synonymy of *Euryptychia saligneana*, p. 30.

On *Sphida obliquata* Gr. & R. being synonymous with *Arzama densa* Walk., p. 30.

CHARLES V. RILEY. The Periodical Cicada. *Cicada septendecim L.*, and race *tredecim* Riley.

Report of the Entomologist, Department of Agriculture, 1885, pp. 233–258 (27–52), pl. 1, 5, and fig. 1, pl. 6.

The seventeen and thirteen-year races of the Cicada and their first discovery; the two varieties of the Cicada, their differences and specific value; development habit and food of the larva; transformations and issuing of the imago; influence of civilization on the appearance of the Cicada; song notes of the Cicada; variation in time of appearance; enemies; the supposed sting of the Cicada; oviposition; injury to fruit-trees and remedies; geographical distribution and future appearance of all known broods; influence of climate upon the races and experiments in the transfer of eggs; the Cicada in 1886.

CHARLES V. RILEY. The Leather-Beetle or Toothed Dermestes.

Dermestes vulpinus, Fabr.

Report of the Entomologist, Department of Agriculture, 1885, pp. 258–264 (52–58) pl. VI, fig. 2

Injury to boots and shoes; history of its occurrence at Saint Louis; points in habits and natural history; characteristics of the different stages; litigation growing out of the injury caused by the insect; history of the Savannah case; remedies and prevention; description of full-grown larva; figures of egg, larva, pupa, imago, details of larva and imago.

CHARLES V. RILEY. Miscellaneous insects.

Report of the Entomologist, Department of Agriculture, 1885; pp. 228–289 (22–83); map 1; plates 1, 5–8.

Contains divisions and sub-chapters, with the titles given below: Destructive Locusts or "Grasshoppers," pp. 228–233 (22–27), pl. 8; the Rocky Mountain locust, *Caloptenus spretus* Thomas, pp. 228–229 (22–23); the California migratory locust, *Melanoplus devastator*, Scudder, pp. 229–232 (23–26); non-migratory species, pp. 232–233 (26–27); the Periodical Cicada, *Cicada septendecim*, L. and race *tredicim*, Riley, pp. 233–258 (27–52), map 1, pl. 1, 5 and fig. 1, pl. 6; the Leather-Beetle or Toothed Dermestes, *Dermestes vulpinus*, Fabr., pp. 258–264 (52–58), pl. 6, fig. 2; the Garden Web-Worm, *Eurycreon rantalis*, Guen., pp. 265–270 (59–64), pl. 6, fig. 3; the Dark-sided Cut-Worm, larva of *Agrotis messoria*, Harr., pp. 270–275 (64–69), pl. 7, fig. 1; the Strawberry Weevil, *Anthonomus musculus*, Say, pp. 276–282 (70–76), pl. 7, figs. 6 and 7; the Pear midge or Pear diplosis, *Diplosis nigra* (?), Meigen, pp. 283–289 (77–83), pl. 7, figs. 2, 3 and 4.

CHARLES V. RILEY. Destructive Locusts or "Grasshoppers."

Report of the Entomologist, Department of Agriculture, 1885; pp. 228–233 (22–27), pl. 8.

Appearance of and injury done, in 1885, by *Caloptenus spretus*, *Melanoplus devastator*, *M. atlanis*, *M. femur-rubrum;* distinguishing characters of the last-named species; also unusual abundance of other non-migratory species.

CHARLES V. RILEY. The Garden Web Worm. *Eurycreon rantalis*, Guen.

Report of the Entomologist, Department of Agriculture, 1885, pp. 265–270 (59–64), pl. 5, fig. 3.

Great damage done in 1885; general characteristics of the different stages; former injuries, localities of damage in 1885; food plants, habits and natural history; cocoon; enemies; remedies; figures of larva, pupa, imago, details of larva and pupa.

CHARLES V. RILEY. The Dark-sided Cut-Worm. Larva of *Agrotis messoria*, Harr.

Report of the Entomologist, Department of Agriculture, 1885, pp. 270–275 (64–69), pl. 7, fig. 1.

Injury to onions; habits and natural history; number of broods; hibernation; remedies and prevention; report of John B. Smith; report of Thomas Bennett; figures of larva and moth.

CHARLES V. RILEY. The Strawberry Weevil. *Anthonomus musculus*, Say.

Report of Entomologist, Department of Agriculture, 1885, pp. 276–282 (70–76), pl. 7, figs. 5, 6.

Past history; injury in 1885; Mr. Smith's observations; diversity of habit in the genus *Anthonomus;* natural history of other species of *Anthonomus;* inquilinous species; species having different habits; remedies; character and synonymy; description of imago and its variations; comparison with *A. suturalis*, figures of imago and strawberry plant infested with the weevil.

CHARLES V. RILEY. The Pear Midge or Pear Diplosis. *Diplosis nigra* (?), Meigen.

Report of the Entomologist, Department of Agriculture, 1885, pp. 283–289 (77–83), pl. 7, figs. 2, 3, 4.

Decisive steps for eradication recommended; life history and habits; one annual generation; dates of issuance of imago; parasites; remedies; it is probably an introducted species; Schmidberger's account of the European pear midge; Dr. J. Mik's opinion; descriptions of imago, larva and pupa; classificatory value of the genitalia; figures of larva, pupa, imago, details of larva and imago.

CHARLES V. RILEY. The Rocky Mountain Locust, *Caloptenus spretus*, Thomas.

Report of the Entomologist, Department of Agriculture, 1885, pp. 228–229 (22–23), pl. 8, fig. 6.

Injury in the Northwest; probabilities for 1886.

CHARLES V. RILEY. The California migratory locust, *Melanoplus devastator*, Scudder.

Report of the Entomologist, Department of Agriculture, 1885, pp. 229–232 (22–26), pl. 8, figs 1, 5.

Abundance of *Melanoplus devastator* in California in 1885; record of previous years; geographical range; distinguishing characters of the species; remedies.

CHARLES V. RILEY. Non-migratory species (of locusts).

Report of the Entomologist, Department of Agriculture, 1885, pp. 232–233 (26–27).

Unusual abundance of and injury done, in various parts of the United States, by *Melanoplus femur-rubrum*, *Melanoplus differentialis*, and *Melanoplus bivittatus*.

CHARLES V. RILEY. Fourth Report of the United States Entomological Commission, being a revised edition of Bulletin No. 3, and the final report on the cotton worm, together with a chapter on the boll worm. By Charles V. Riley, Ph. D. With maps and illustrations. United States Department of Agriculture (Washington, Government Printing Office, 1885), pp. xxxviii, 399, [147]; sixty-four plates and forty-five figures in the text.

CHARLES V. RILEY. Fourth Report of the U. S. Entomological Commission, etc.—Continued.

Contains divisions and chapters, with the titles given below. Title-page, p. i; Resolution House of Representatives, p. ii; Table of Contents, pp. iii–xvi; Letter of Submittal, p. xvii; Members of the (U. S. Entomological) Commission, p. xviii; Preface, pp. xix–xxi; Introduction, pp. xxiii–xxxviii; Chapter I, Classification and Nomenclature—Destructiveness, pp. 1–4; Chapter II, Characters, habits, and natural history, pp. 5–22, figs. 1–8, pl. I; Chapter III, Past history of the cotton worm in the United States, pp. 23–38; Chapter IV, The cotton worm in other countries, pp. 39–44; Chapter V, On the anatomy of *Aletia*, by Charles Sedgwick Minot and Edward Burgess, pp. 44–58, pl. 6–11; Chapter VI, The cotton belt, by Prof. Eugene A. Smith, pp. 59–80, maps I and II; Chapter VII, Terrestrial and meteorological influences affecting the worm, pp. 81–86; Chapter VIII, Natural enemies, pp. 87–119, figs. 10–45; Chapter IX, Preventive measures, pp. 120–127; Chapter X, Remedies; means of coping with the insect; substances used for its destruction, pp. 128–190; Chapter XI, Machinery and devices for the destruction of the worm, by Prof. W. S. Barnard, Ph. D., *Assistant*, pp. 190–252, pl. XIV–LXI; Chapter XII, Machinery and devices for the destruction of the worm (continued), pp. 252–309; Chapter XIII, Machinery and devices for the destruction of the worm (concluded), pp. 310–321; Chapter XIV, History of the literature and bibliography, pp. 322–344; Chapter XV, Insects liable to be mistaken for *Aletia*, pp. 345–354, pl. ii, figs. 1–6, pl. v, pl. lxii; Chapter XVI, The Boll Worm (*Heliothis armigera*, Hübner), pp. 355–384, pl. iii–iv; Explanation to plates, pp. 385–399; appendices, pp. (1)–(92); (Introduction, p. (3)); Appendix I, Report of H. G. Hubbard, pp. (5)–(16); Appendix II, Report of Prof. R. W. Jones, pp. (17)–(23); Appendix III, Report of J. P. Stelle, pp. (25)–(35); Appendix IV, Report of Dr. E. H. Anderson, pp. (37)–(48); Appendix V, Cotton caterpillars in Brazil, by John C. Branner, pp. (49)–(54); Appendix VI, Report of Judge William J. Jones, pp. (55)–(57); Appendix VII, Reports of consuls and consular agents on the cotton crop and its enemies in Mexico, Central and South America, and the West Indies, pp. (59)–(70); Appendix, VIII, Answers to circular No. 7, pp. (71)–(92); Notes, pp. (93)–(121); Index, pp. (123)–(147).

CHARLES V. RILEY. Insects from near Point Barrow.

Report of the expedition to Point Barrow, Alaska (1882–'83), pp. 134–135.

See under John Murdoch (Part IV, Natural History).

CHARLES V. RILEY. Water-beetles destroying carp.

Bull U. S. Fish Com., V, August 21, 1885, p. 311.

CHARLES V. RILEY. Influence of climate on *Cicada septendecim*.

Entomologica Americana, I, No. 5, 1885, p. 91.

Record of experiments in the transferring of eggs of *Cicada septendecim* and *tredecim* into different climates to test the effect of climate on the permanency of the two races.

CHARLES V. RILEY. The present status and future prospects of silk-culture in the United States.

Entomologica Americana, I, No. 7, 1885, pp. 139–140.

Abstract of a paper read at the Ann Arbor meeting of the Am. Ass. Adv. Sci., and printed in *Proc. Am. Assoc. Adv. Sci.*, XXXIV, August, 1885, p. 516.

CHARLES V. RILEY. *Aletia xylina* vs. *A. argillacea*.

Entomologica Americana, I, No. 9, 1885, pp. 161–163.

Summary of the natural history of *Galeruca xantho melaena*, with general descriptions of the different states, and discussion of the remedies available for the destruction of the insects. Figures of the insect in all states, with details of eggs and larva and elm leaves, showing mode of feeding.

CHARLES V. RILEY. The Chester onion pest.

Orange County Farmer (N. Y.), July 2, 1885.

Letter by C. V. Riley, dated June 25, 1885, and addressed to Hon. George W. Greene, Goshen, Orange County, N. Y.; refers to experiments carried on for destroying the onion cut-worm (larva of *Agrotis messoria*); quotes passages on remedies for cut-worms, from the annual report of the United States Entomologist for 1884; recommends the poisoned ball system, and spraying with dilute kerosene emulsion; gives formula and directions for preparing soap-kerosene emulsion.

CHARLES V. RILEY. "Grasshopper" injury. The probability of locust or "grasshopper" injury in the near future, and on a new method of counteracting their injury.

Proceedings of the sixth meeting of the Society for the Promotion of Agricultural Science (held at Ann Arbor, Mich., 1885), pp. 38–39.

Also in *Proc. Am. Assoc. Adv. Sci.*, XXXIV, August, 1885, pp. 579; 520.

Also in *Prairie Farmer*, LVII, October 10, 1885, p. 609.

CHARLES V. RILEY. "Grasshopper" injury—Continued.

Abstract of paper read before the Ann Arbor meeting of the Am. Ass. Adv. Sci., August 28, 1885.

Discusses the injury done by locusts in 1885, and the probabilities for the next year; refers to the extensive egg-laying of *Caloptenus spretus* in Montana and Dakota, and points out the possible danger resulting from the increase of this species; describes the novel method of poisoning *Melanoplus devastator* in California by using a bait composed of arsenic, sugar, bran, and water.

CHARLES V. RILEY. Some popular fallacies and some new facts regarding *Cicada septendecim* L.

Proc. Am. Assoc. Adv. Sci., XXXIV, August, 1885, p. 334.

Author's separate copies published May, 1886.

A very short abstract of the paper read before the Ann Arbor meeting of the Am. Ass. Adv. Sci.

CHARLES V. RILEY. On the Parasites of the Hessian Fly.

Proc. U. S. Nat. Mus., VIII, September 14, 1885, pp. 413–422. Plate XXIII.

Also as abstract in *Proc. Am. Ass. Adv. Sci.*, XXXIV, August, 1885, pp. 332–334.

Author's separate copies published May, 1886.

JOHN A. RYDER. A new system of oyster-culture.

Science, VI, No. 147, Nov. 27, 1885, pp. 465–467.

JOHN A. RYDER. Success in hatching the eggs of the codfish.

Science, VII, No. 153, Jan. 8, 1886, pp. 26–28.

JOHN A. RYDER. A Saunter up the Sandy.

The American Field, Jan. 23 and 30, 1885, pp. 85–86, and 109–110.

Describes the experiences of the author in the country around the head of the Big Sandy River, including a trip through the region of moonshiners, the natural bridge of Elliott County, Ky., and other objects in the wonderful natural scenery of the surrounding country.

JOHN A. RYDER. Protective contrivance for eggs.

Forest and Stream, 25, No. 5, Aug. 27, 1885, pp. 89–90.

JOHN A. RYDER. The oyster problem actually solved.

Forest and Stream, 25, No. 13, Oct. 22, 1885, pp. 249–250.

JOHN A. RYDER. Hatching codfish eggs.

Forest and Stream, 25, No. 25, Jan. 14, 1886, p. 488.

JOHN A. RYDER. The resting position of the oyster. A correction.

Nature, Nov. 26, 1885, pp. 80–81.

JOHN A. RYDER. The swimming habits of the sunfish.

Science, Aug. 7, 1885, pp. 103–104.

JOHN A. RYDER. The development and structure of *Microhydra Ryderi*, Potts.

American Naturalist, vol. 19, No. 12, Dec., 1885, pp. 1232–1236.

JOHN A. RYDER. The development of the toad-fish.

American Naturalist, Jan., 1886, pp. 77–80.

JOHN A. RYDER. On some points in microtomy.

Proc. Am. Ass. Adv. Sci., XXXIII, 1885, pp. 565–566.

JOHN A. RYDER. Answers to questions about fattening oysters.

Bull. U. S. Fish Com., V, Sept. 28, 1885, p. 416.

JOHN A. RYDER. On the availability of embryological characters in the classification of the *Chordata*.

Amer. Nat., Sept., 1885, vol. 19, Nos. 8, 9, pp. 815–819, and Sept., 1885, pp. 903–907.

JOHN A. RYDER. On the genesis of the extra terminal phalanges in the Cetacea.

Amer. Nat., vol. 19, No. 10, Oct., 1885, pp. 1013–1015.

This note presents the substances of conclusions reached by Mr. Ryder in his memoir entitled, "On the development of the Cetacea, together with a consideration of the probable homologies of the flukes of Cetaceans and Sirenians," now in press.

JOHN A. RYDER. On the manner in which the cavity of the heart is formed in certain Teleosts.

Amer. Nat., vol. 19, No. 10, Oct., 1885, pp. 1015–1016.

JOHN A. RYDER. The archistome theory.

Amer. Nat., vol. 19, No. 11, Nov., 1885, pp. 1115–1121.

JOHN A. RYDER. Preliminary notice of the development of the toad-fish, *Batracha tau.*

Bull. U. S. Fish Com., VI, pp. 4–8.

JOHN A. RYDER. On the earlier stages of cleavage of the Blastodisk of *Raia erinacea.*

Bull. U. S. Fish Com., VI, pp. 8–10, pl. I.

JOHN A. RYDER. On the intraovarian gestation of the red-fish, *Sebastes marinus.*

Bull. U. S. Fish Com., VI, pp. 92–94.

O. SALVIN.

See under F. Du Cane Godman.

PHILIP LUTLEY SCLATER. Catalogue | of the | Passeriformes | or | Perching birds | in the | collection | of the | British Museum | — | . *Fringilliformes:* Part II | containing the families | *Cœrebidæ*, *Tanagridæ*, and *Icteridæ*, | by | Philip Lutley Sclater. | London: | Printed by order of the trustees, | 1886.

8vo. pp. I–XVII+1–431. Plates I–XVII.

Material in the National Museum has been frequently used by the author in reaching his conclusions.

NEWTON PRATT SCUDDER. Department of the Interior | U. S. National Museum | — Bulletin | of the | United States National Museum. | No. 23. | Bibliographies of American naturalists. II. The published writings of Isaac Lea, LL. D., | by | Newton Pratt Scudder. | — | Washington: | Government Printing Office. | 1885.

8vo. pp. I–LIX, 1–278. Plates, 1.

ERNEST E. T. SETON. Notes on Manitoban Birds.

The Auk, II, July, 1885, pp. 267–271.

The specimen of "Copper-ruffed Partridge" referred to is in the National Museum.

R. W. SHUFELDT. Description of *Hesperomys trucí*, a new species belonging to the subfamily murinæ.

Proc. U. S. Nat. Mus., VIII, Sept. 14, 1885, pp. 403–408. Plate XXI (8 figs).

Describes a new mouse captured at Fort Wingate, New Mexico, and dedicated by the author to Mr. F. W. True, Curator, Dept. of Mammals, U. S. National Museum.

R. W. SHUFELDT. The osteology of *Amia calva*, including certain special references to the skeleton of Teleosteans.

Fourteen plates. One figure.

Rep. U. S. Com'r Fish and Fisheries, Part VI, pp. 747–878. (Also as a separate.)

HUGH M. SMITH. *Ereunetes occidentalis* on the Lower Potomac.

The Auk, II, Oct., 1885, p. 385.

Specimens Nos. 105351–105354, U. S. National Museum.

HUGH M. SMITH. *Harelda hyemalis* in Maryland in summer.

The Auk, II, Oct., 1885, p. 385.

Refers to No. 105301, U. S. National Museum, presented by the author.

HUGH M. SMITH. Birds new to the District of Columbia.

The Auk, III, Jan., 1886, pp. 139–140.

Relating chiefly to specimens in the National Museum collection.

JOHN B. SMITH (Editor). Entomologica Americana.

Current numbers, I, No. 4, 1885, to II, No. 3, 1886 (inclusive).

A monthly journal devoted to entomology in general.

JOHN B. SMITH (Secretary). Proceedings of the Entomological Club of the American Association for the Advancement of Science.

Entomologica Americana, I, No. 7, 1885, pp. 121–125; No. 9, 1885, pp. 164–178; No. 11, 1886, pp. 209–214; No. 12, 1886, pp. 222–227.

JOHN B. SMITH (Secretary). Abstracts of the Proceedings of the Brooklyn Entomological Society.

Entomologica Americana, I, No. 4, 1885, p. 80; No. 7, 1885, p. 140; No. 8, 1885, pp. 159–160; No. 9, 1885, pp. 179–180; No. 10, 1886, p. 200; No. 11, 1886, p. 220; No. 12, 1886, p. 229; II, No. 1, 1886, pp. 19–20; No. 2, 1886, p. 44; No. 3, 1886, p. 64.

JOHN B. SMITH (Secretary). Abstracts of the Proceedings of the Entomological Society of Washington.

Entomologica Americana, I, No. 9, 1885, p. 180; No. 10, 1886, p. 200; No. 11, 1886, p. 220; No. 12, 1886, pp. 229–230; II, No. 1, 1886, p. 20; No. 2, 1886, p. 44.

JOHN B. SMITH. Notes and News.

Entomologica Americana, I, No. 4, 1885, pp. 78–79.

(1) Methods of preserving *Cassidæ* and iridescent insects. (2) Notes on *Attacus splendidus* and *A. cinctus*, giving the differences between them. (3) Notes on a peculiar appendage in *Ctenucha fulvicollis* and the relation of the *Arctiidæ* and *Zygænidæ*. (4) Miscellaneous news and information.

JOHN B. SMITH. An introduction to a classification of the North American *Lepidoptera*.

Entomologica Americana, I, No. 5, 1885, pp. 81–87.

Gives a critical review of the genera of the *Sphingidæ* and a brief characterization of the North American forms; making radical changes in the synonymy and system of classification heretofore in use. Followed by a synoptic table of the genera.

JOHN B. SMITH. Some new species of *Hispini*.

Entomologica Americana, I, No. 5, 1885, pp. 94–95.

Describes as new, *Microrhopala uniformis*, *Odontota Horni*, *O. lateritia*, *Charistena bicolor*, and comments on allied species.

JOHN B. SMITH. A study of the species of *Cryptobium*, of North America. (Review.)

Entomologica Americana, I, No. 5, 1885, pp. 99–100.

JOHN B. SMITH. Cyanide versus alcohol in collecting.

Entomologica Americana, I, No. 6, 1885, p. 120.

Discusses the best material to use in killing insects of various orders.

JOHN B. SMITH. Fourteenth report of the State entomologist on the noxious and beneficial insects of the State of Illinois. (Review.)

Entomologica Americana, I, No. 8, 1885, pp. 157–158.

JOHN B. SMITH. Notes on some structural characters of the *Lepidoptera*.

Entomologica Americana, I, No. 9, 1885, pp. 164–167.

Read before the Entomological Club of the Amer. Assoc. Adv. Science, Aug. 25, 1885.

Discusses and describes the modifications of genital structure in the *Noctuidæ* and *Bombycidæ*, and more particularly comments on the structure of *Zygænidæ*, *Syntomidæ*, *Sesiidæ*, *Macroglossæ*, and *Bombycidæ*. An outline of a classification based partly on genital structure. The different proportions of the legs, and the epiphyses to the front tibia were described and commented on.

JOHN B. SMITH. *Cosmosoma omphale*.

Entomologica Americana, I, No. 10, 1886, pp. 181–186, Fig. 7.

Read before the Brooklyn Entomological Society, Nov. 3, 1885.

Describes a peculiar secondary sexual character of the ♂ of this species, consisting of a large cavity in the abdomen, filled with a cottony or silky substance. This substance is folded in two pads and the ventral opening is hinged in such a way that by merely lifting the abdomen, the cavities open and these pads are exposed. Detailed descriptions and drawings of the parts are given.

JOHN B. SMITH. How shall we create and foster an interest in the study of entomology?

Entomologica Americana, I, No. 12, 1886, pp. 225–227.

Discusses the present state of the science; the number of entomologists and how a greater popular interest might be excited; the needs of the students and how they may be filled.

JOHN B. SMITH. [Arrangement of the *Sphingidæ*.]

Entomologica Americana, II, No. 1, 1886, pp. 6–7.

Reply to Prof. C. H. Fernald's article in the same issue of the journal criticising the author's arrangement of the *Sphingidæ*.

JOHN B. SMITH. Studies on North American *Chalcididæ* with descriptions of new species from Florida. (Review.)

Entomologica Americana, II, No. 1, 1886, p. 19.

JOHN B. SMITH. The Butterflies of the Eastern United States. (Review.)

Entomologica Americana, II, No. 2, 1886, pp. 43–44.

JOHN B. SMITH. Notes on the *Saturnidæ*.

Entomologica Americana, II, No. 2, May, 1886, p. 44.

Gives a brief outline of the characters of the family and of proposed subdivision on the basis of venation and antennal structure.

JOHN B. SMITH. Report on the Onion Cut-worm, *Agrotis messoria*.

Rept. U. S. Dept. Agric., 1885, pp. 273–274.

Gives the results of observations of the habits of this larva in onion fields, with a statement of damage done and remedies applied.

JOHN B. SMITH. Report on the Strawberry Weevil, *Anthonomus musculus*.

Rept. U. S. Dept. Agric., 1885, pp. 277–278.

Gives the results of observations on this insect on the strawberries of Staten Island.

JOHN B. SMITH. Larva of *Hemileuca maia*; bibliography of.

Can. Ent., XVIII, March, 1886, p. 60.

Gives references to the literature of this larva, and where figured.

SIDNEY I. SMITH. The Abyssal Decapod Crustaceæ of the *Albatross* Dredgings in the North Atlantic.

Ann. and Mag. Nat. Hist., March, 1886, pp. 187–198.

This article is in the main abstracted from the introductory portion of the author's "Report on the Decapod Crustaceæ of the *Albatross* Dredgings off the East Coast of the United States during the Summer and Autumn of 1884," with twenty plates, recently presented to the U. S. Commissioner of Fish and Fisheries, by whose permission it is here published in advance of the Government report. The region it covers is limited on the south by the latitude of Cape Hatteras.

The following lists are given with notes:

List of Decapoda taken below 1,000 fathoms in the North Atlantic by the *Albatross* in 1883–85, with the bathymetrical range of each species.

Species inhabiting the bottom or its immediate neighborhood.

Species probably not confined to the immediate neighborhood of the bottom, but showing structural evidence of inhabiting abyssal depths.

Doubtful, but probably inhabiting abyssal depths.

Species probably not inhabiting abyssal depths.

The structural and other characteristics of the deep-sea forms are discussed at some length.

R. E. C. STEARNS. Edible Shell-fish found near Cuba.

Bull. U. S. Fish Com., V, Aug. 21, 1885, pp. 311–312.

R. E. C. STEARNS. Note on the Clams of the Pacific coast.

Bull. U. S. Fish Com., V, Sept. 15, 1885, pp. 356–357.

R. E. C. STEARNS. The distribution of species.

Forest and Stream, XXVI, No. 16, May 13, 1885, pp. 304–305.

This paper was read before the Chicago meeting of American Fisheries Society, April 14, 1886. After referring to the artificial distribution of species, as in fish culture, attention is called to the incidental distribution (as opposed to intentional), as in case of weeds, small mammals, insects, and mollusks.

R. E. C. STEARNS. [The Teredo or Shipworm.]

Amer. Nat., XX, 2, Feb., 1886, pp. 131–136.

This article is an answer to a letter of inquiry addressed to the Museum by one of its correspondents.

SILAS STEARNS. Notes on the Great Dolphin, *Coryphæna hippurus*, Linné.

Proc. U. S. Nat. Mus., VIII, Dec. 7, 1885, pp. 635–636.

LEONHARD STEJNEGER. Department of the Interior: | U. S. National Museum. | — | Bulletin | No. 29 | of the | United States National Museum. | Results | of | Ornithological Explorations | in | the Commander Islands and in Kamtschatka. | By | Leonhard Stejneger | — | Washington: | Government Printing Office. | 1885.

8vo. pp. 1–382. Plates, 1–8; 7 figures.

The official report on the ornithological collection made by the author during his travels in Kamtschatka, 1882–'83. The first part of the book treats of the species collected; the second part contains a list of all the species reported to inhabit Kamtschatka; the third part embraces the "conclusions," being a summary of the composition of the avifauna, the migrations, etc.

LEONHARD STEJNEGER. "Toporok.", Tufted Puffin: *Lunda cirrhata*, Pall.

Random Notes on Natural History, III, 1886, pp. 17–19.

Editorial reprint from Bulletin No. 29, U. S. National Museum.

LEONHARD STEJNEGER. Notes on some apparently preoccupied Ornithological Generic Names.

Proc. U. S. Nat. Mus., VIII, Sept. 14, 1885, pp. 409–410.

Clangula Flem. as applied to the Golden-eyes is preoccupied by Leach for *Harelda*; *Glaucionetta* is proposed as a substitute; *Canace* Reichenb., previously applied to a dipterous insect, changed to *Canachites*.

LEONHARD STEJNEGER. Articles *Picariæ* (except Humming-birds) and *Passeres*.

The Standard Natural History, IV, 1885, pp. 368–441 and 458–547.

To a great extent based on material in the Museum. Fig. 197*c* and fig. 235 are drawn from specimens in the Museum collection.

LEONHARD STEJNEGER. Grieve on the Great Auk, or Garefowl. (Review.)

The Auk, III, Apr., 1886, pp. 262–263.

LEONHARD STEJNEGER. Meves, on the size and color of the eyes of European birds. (Review.)

The Auk, III, April, 1886, pp. 265-266.

LEONHARD STEJNEGER. Analecta Ornithologica. Sixth series. XXIX. *Jacana* contra *Parra*. XXX. *Colymbus nigricollis*, not a North American Bird. XXXI. "*Sinorhynchus* Merrem, 1819." XXXII. *Dendroica vigorsii* (Aud.).

The Auk, II, Oct., 1885, pp. 337–343.

LEONHARD STEJNEGER. On the alleged Occurrence of the Pacific Eider in Labrador.

The Auk, II, Oct., 1885, p. 386.

Refers to Degland and Gerbe's statement in relation to specimens of "*Somateria mollissima*" from Newfoundland having a V-shaped mark on the throat.

LEONHARD STEJNEGER. Letter to Dr. B. H. Warren, in reply to inquiries concerning food-habits of Hawks and Owls.

Daily Local News (West Chester, Pa.), March 5, 1886.

Reprinted in *Forest and Stream*. XXVI, No. 9. March 25, 1885, p. 164.

Pronounces the idea of systematically persecuting the majority of Hawks and Owls "simply preposterous," and advocates the speedy repeal of the act of June 3, 1885, of the laws of Pennsylvania, "since most of the birds alluded to are among the very best friends of the farmer."

LEONHARD STEJNEGER. Vitus I. Bering og de Russiske Opdagelsesrejser fra 1725–43. Af P. Lauridsen. (Review.)

Naturen: Dec., 1885, pp. 194, 195.

LEONHARD STEJNEGER. Fotografiske Papirnegativer.

Naturen, X, June, 1886, pp. 92, 93.

LEONHARD STEJNEGER. Fra det yderste Östen. | V | Rejsebreve | af | Leonhard Stejneger. | — | (Separataftryk af "Naturen," 1885–1886.) | — | Kristiania.— Gröndahl & Söns, Bogtrykkeri. |

8vo. pp. 1–51.

Also as Fra det yderste Östen. V. En Baadtur rundt Barings-öen. *Naturen:* 1885, pp. 150–157 and 167–174; 1886, pp. 33–36 and 49–52.

A popular account of the author's circumnavigation of Bering Island in the autumn of 1883. *See also* under American Ornithologists' Union.

E. STERLING. Salmon in the Columbia.

Forest and Stream, XXV, 9, Sept. 24, 1885, p. 168.

LIVINGSTON STONE. The trout of Sunapee Lake.

Forest and Stream, XXVI, 11, April 8, 1886, p. 208.

JAMES G. SWAN. Notes on the Black Cod of the North Pacific Ocean.

Bull. U. S. Fish Com., V, pp. 225–234.

FREDERICK W. TRUE. Contributions to the history of the Commander Islands, No. 5. Description of a new species of Mesoplodon, *M. Stejnegeri*, from Bering Island.

Proc. U. S. Nat. Mus., VIII, Oct. 19, 1885, pp. 584, 585, plate XXV.

FREDERICK W. TRUE. A note upon the *Hyperoodon semijunctus* of Cope.

Proc. U. S. Nat. Mus., VIII, Oct. 19, 1885, pp. 587–589, one cut.

FREDERICK W. TRUE. Suggestions to the keepers of the United States Life-Saving stations, light-houses, and light-ships, and to other observers, relative to the best means of collecting and preserving specimens of whales and porpoises.

Report of the United States Commissioner of Fish and Fisheries, 1883 [1885]. pp. 1157–1182. Plates 11. Five figures. Special index.

(Published also as a separate, with title-page and separate paging.)

FREDERICK W. TRUE. A rare Dolphin.

Science, VI, No. 128, July 17, 1885, p. 44.

FREDERICK W. TRUE. The British Museum of Natural History.

Science, VI, No. 132, Aug. 14, 1885, pp. 127–130.

FREDERICK W. TRUE. A means of distinguishing the Canada lynx from the Bay lynx.

Science, VII, No. 169, April 30, 1886, p. 396.

Gives certain cranial characters, which render *L. canadensis* readily distinguishable from *L. rufus* and its varieties.

FREDERICK W. TRUE. A task for Anatomists.

Science, VII, No. 171, May 14, 1886, pp. 428–429.

LUCIEN M. TURNER. Hawk and Owl.

Forest and Stream, XXVI, No. 9, March 25, 1885, pp. 163–164.

Treats of their value to farmers.

LUCIEN M. TURNER. List of the Birds of Labrador, including Ungava, East Main, Moose, and Gulf Districts of the Hudson Bay Company, together with the Island of Anticosti.

Proc. U. S. Nat. Mus., VIII, July 13, 1885, pp. 233–254.

A. E. VERRILL. Notice of recent additions to the Marine Invertebrata of the northeastern coast of America, with descriptions of new genera and species and critical remarks on others. Part V.—*Annelida, Echinodermata, Hydroida, Tunicata.*

Proc. U. S. Nat. Mus., VIII, Sept. 17 and 22, 1885, pp. 424–448.

One new genus of Annelids, *Ophioglycera*, is described on page 436. The following species are also described in greater or less detail:

ANNELIDA.

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Castalia cincinnata, sp. nov	434
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Ophioglycera gigantea V	436
Polydora tubifex, sp. nov	438
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ECHINODERMATA—continued.

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Ophiolebes acanellæ V 445
Amphiura otteri Ljung. (?), Lym 445
fragilis, sp. nov 445
Ophioscolex quadrispinus V 446
Hemieuryale tenuispina V 446

HYDROIDA.

Cladocarpus flexilis, sp. nov 447

TUNICATA.

Culeolus Tanneri, sp. nov 447

CHARLES D. WALCOTT. Note on some Paleozoic Pteropods.
Amer. Journ. Sci., XXX, July, 1885, pp. 17–21. Also as a separate.

F. L. WASHBURN. Deep-sea dredging on the United States steamer *Albatross*.
Trans. Am. Fish. Soc., 1886, p. 17.

SAMUEL WEBBER. Trout of Sunapee Lake.
Forest and Stream, XXVI, 3, Feb. 11, 1886, p. 51.

SAMUEL WEBBER. The new trout of Sunapee Lake.
Forest and Stream, XXVI, 8, Mar. 18, 1886, p. 149.

SAMUEL WEBBER. The trout of Sunapee Lake.
Forest and Stream, XXVI, 11, Apr. 8, 1886, p. 208.

CHARLES A. WHITE. On the fresh-water invertebrates of the North American Jurassic.
Bulletin U. S. Geological Survey, No. 29, pp. 1–24 (695–712), pl. I–IV.

HENRY S. WILLIAMS. On the classification of the Upper Devonian.
Proc. Amer. Assoc. Adv. Sci., XXXIV, Aug., 1885, pp. 222–234.

S. S. WOODARD. The trout of Sunapee Lake.
Forest and Stream, XXVI, 15, May 6, 1886, p. 287.

PART V.

LIST OF ACCESSIONS TO THE U. S. NATIONAL MUSEUM DURING THE YEAR ENDING JUNE 30, 1886, TOGETHER WITH DESCRIPTIVE NOTES AND INDICES.

INTRODUCTORY NOTE.

The following order has been observed in the description of each object or group of objects in the list of accessions:

(1) Name of specimen or of the class to which related.
(2) Description of specimen, with locality whence obtained.
(3) Name of sender, with address.
(4) Current accession number in the Museum Register.
(5) The calendar year in which received.
(6) The number of the department to which the accession has been assigned, these numbers corresponding with those given in the classification of the scientific departments.

LIST OF ACCESSIONS.*

INSECT, *Citheronia regalis*.

A. B. HARING, Frenchtown, New Jersey. 16209. '85. (X)

YELLOW CALCITE, for examination.

JAMES F. DOUGLAS, Tyler, Texas. 16210. '85. (XVI)

HABITACULUM of the cicada, and chimney of *Cicada septendecim*.

S. M. SENER, Lancaster, Pennsylvania. 16211. '85, (X)

BIRDS (23 specimens, 14 species), from Richland County, Illinois.

ROBERT RIDGWAY, Smithsonian Institution. 16212. '85. (V, A)

BIRDS' NEST AND EGGS. *Seiurus motacilla* (nest and 6 eggs), *Pipilo erythrophthalmus* (nest and 3 eggs), *Agelaius phœniceus* (nest and 4 eggs), *Empidonax trailli* (nest and 4 eggs), *Geothlypis trichas* (nest and 4 eggs), *Rallus elegans* (nest and 11 eggs), *Empidonax acadicus* (1 nest), *Vireo noveboracensis* (1 nest), from Indiana and Illinois.

ROBERT RIDGWAY, U. S. National Museum. 16212. '85. (V, B)

MINERALS exhibited by U. S. General Land Office at the New Orleans Exposition, 1884.

U. S. GENERAL LAND OFFICE, Washington. 16213. '85. (XVI)

ORES.

U. S. GENERAL LAND OFFICE, Washington. 16213. '85. (XVIII)

BUILDING STONES.

U. S. GENERAL LAND OFFICE, Washington. 16213. '85. (XVII)

BRITISH EXCHEQUER TALLY. (Described in this Report, Part I, page 64).

A. W. FRANKS, British Museum. (Through W. T. Thiselton Dyer.) 16214. '85. (I)

TUFT-EARED SQUIRREL, *Sciurus aberti* (skin).

Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 16215. '85. (IV)

BIRD, *Icterus galbula*, in the flesh, for identification.

JAMES W. ROGAN, Rogersville, Tennessee. 16216. '85. (V, A)

GRASS, *Sorghum nutans*, Gray, for examination.

JAMES W. ROGAN, Rogersville, Tennessee. 16216. '85. (XV)

INSECT, *Dynastes tityus*, Linn., for identification.

CHARLES BALL, Waverly, Tennessee. (Through Mrs. M. E. Sawyer.) 16217, '85. (X)

OVA of fish, reptiles, sharks, and insects; fish ovaries and spermaries.

Miss ROSA SMITH, San Diego, California. 16218. '85. (XXI)

FISHES, *Erotelis smaragdus*, *Mugil*, *Zygonectes auroguttatus*, *Z. nottii*, *Heterandria ommata*, *Etheostoma davisoni*, from Florida.

O. P. HAY, Irvington, Indiana. 16219. '85. (VII)

TARANTULA SPIDER, belonging to the genus *Chaleroma*, Auss., the species being probably undescribed.

J. B. BOWMAN, Aleman, New Mexico. 16220. '85. (X)

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* When the locality of an accession is the same as the address of the sender, no mention of locality is made in connection with the description of the accession.

BIRDS (13 specimens, 9 species), *Parus inornatus griseus, P. montanus, Spinus pinus, Poocætes gramineus confinis, Spizella socialis arizonæ, Amphispiza belli nevadensis, Junco annectens, J. caniceps, Dryobates villosus harrisii.*

Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 16221. '85. (V, A)

PLANTS, *Urtica gracilis.*

FELIX FREMEREY, Newark, New Jersey. 16222. '85. (I)

IRON ORE.

C. E. COFFIN, Muirkirk, Maryland. 16223. '85. (XVIII)

FUNGUS.

H. C. LAY, Jr., Telluride, Colorado. 16224. '85. (XV)

STONE IMPLEMENTS. Leaf-shaped implement, arrowheads (3), polished celts (3), grooved axe, and a rude or unfinished pierced tablet.

Dr. E. C. BLACK, Wheatland, Indiana. 16225. '85. (III, A)

SILICIFIED WOOD, chalcedony nodule, fragment of drusy quartz on silicified wood and fragment of chalcedony.

Dr. E. C. BLACK, Telluride, Colorado. 16225. '85. (XVI)

FRESH-WATER MUSSELS, *Unio* (10 species), and a few other river shells.

Miss JULIA BLACK, Wheatland, Indiana. 16226. '85. (IX)

STALAGMITIC DEPOSIT, containing bones of mammals; from Todd's limekiln quarry, near Cartersville, Georgia.

U. S. GEOLOGICAL SURVEY, Washington. 16227. '85. (IV)

AMERICAN JUTE, probably *Scirpus validus*; fiber and pulp.

FRANCIS JEFFEREY, Ketchum, Alturas County, Idaho. 16228. '85. (I)

KNIFE used by fishermen on Lake Erie in the vicinity of Cleveland and Sandusky.

CHARLES CAWOOD, Cleveland, Ohio. 16229. '85. (I)

GRAPSOID CRAB, probably *Sesarina*, young; from Cape San Antonio, Cuba.

L. S. FOSTER, New York City. 16230. '85. (XI)

BARITE (4 fragments).

C. M. GILMORE, Alexandria, Virginia. 16231. '85. (XVI)

SEALING WAX. Supplementary to accession 15971.*

DENNISON MANUFACTURING COMPANY, Philadelphia, Pennsylvania. 16232. '85. (I)

ANTIQUITIES, from France.†

THOMAS WILSON, United States Consul, Nice, France. 16233. '85. (III)

PIG IRON and infusible slag, for examination.

JOHN J. WEIMER, Stoutsville, Ohio. 16234. '85. (XVIII)

YELLOW-HEADED BLACKBIRD, *Xanthocephalus icterocephalus*, in the flesh.

J. B. BOWMAN, Aleman, New Mexico. 16235. '85. (V, A)

SPIDER, probably a new species. Will be described by Dr. George Marx as *Thaleromata niger*.

J. B. BOWMAN, Aleman, New Mexico. 16235. '85. (X)

KINKAJOU, *Cercoleptes caudivolvulus* (alive), from South America.

Mrs. OLIVER T. MILLER, Brooklyn, New York. 16236. '85. (IV)

MINIATURE STATUETTE of "Liberty Enlightening the World" (6 inches in height).

AMERICAN COMMITTEE OF THE STATUE OF LIBERTY (through Richard Butler, secretary). 16237. '85. (I)

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* A list of samples was published in the Museum Report, 1885, p. 206.

† The boxes containing this collection have not yet been unpacked.

CASSIN'S FINCH, *Peucæa cassini* (skin), and Golden-fronted Woodpecker, *Centurus aurifrons* (2 skins), from Bexar County, Texas. (Exchange.)
THOMAS MCILWRAITH, Hamilton, Ontario, Canada. 16238. '85. (V, A)

STIBNITE, manganese, novaculite, and coal.*
Dr. J. GUY LEWIS, Little Rock, Arkansas. 16239. '85. (XVIII)

GOLD ORE from Georgia and copper ore from Tennessee.
WILLIAM BEAL, Murphy, North Carolina. 16240. '85. (XVIII)

ORES.* (Exchange.)
LEWIS R. SHARP, Leadville, Colorado. 16241. '85. (XVIII)

GOLD AND SILVER ORES.*
Dr. WILLIAM HALL, Central City, Colorado. 16242. '85. (XVIII)

ANTIMONY, mercury, tin, and iron ores. (Exchange.)
Prof. HENRY G. HANKS, San Francisco, California. 16243. '85. (XVIII)

KRUPP STEEL made by the Krupp dephosphorizing process.
CAMBRIA IRON COMPANY, Johnstown, Pennsylvania. 16244. '85. (XVIII)

MICA, and tin ore from the Black Hills.
R. E. FLEMING, Mandarin, Dakota. 16245. '85. (XVIII)

QUARTZITE, from Sioux Falls, Dakota (2 specimens); concretion, from Cannon Ball River, Dakota, and a large block of volcanic breccia.
R. E. FLEMING, Mandarin, Dakota. 16245. '85. (XVIII)

MANGANESE, iron, and corundum.* (Exchange.)
N. P. PRATT, Atlanta, Georgia. 16246. '85. (XVIII)

ORES,* a large and valuable collection.
Col. GEORGE L. SHOUP, Salmon City, Idaho. 16247. '85. (XVIII)

COAL, a large collection, including 8 sections of veins.
Prof. J. R. PROCTOR, Lexington, Kentucky. 16248. '85. (XVIII)

LEAD, silver, and copper ores.*
W. A. CLARK, Butte, Montana. 16249. '85. (XVIII)

SILVER and lead ores.*
JOHN S. HARRIS, Helena, Montana. 16250. '85. (XVIII)

IRON ORE and gypsum.*
F. W. NOBLE, Detroit, Michigan. 16251. '85. (XVIII)

ORES and a series of pictures illustrating mining scenes.*
W. M. HAVENOR, Reno, Nevada. 16252. '85. (XVIII)

SILVER and iron ores.*
Prof. N. SPATCIER, Las Cruces, New Mexico. 16253. '85. (XVIII)

ZINC. (Exchange.)*
Prof. GEORGE J. COOK, New Brunswick, New Jersey. 16254. '85. (XVIII)

ORES.*
J. C. SWASH, Union, Oregon. 16255. '85. (XVIII)

IRON and copper ores.*
A. J. MCWHIRTER, Nashville, Tennessee. 16256. '85. (XVIII)

COAL.*
F. E. ROESLER, Dallas, Texas. 16257. '85. (XVIII)

IRON and copper, from North Carolina and Tennessee.*
C. H. WARING, Knoxville, Tennessee. 16258. '85. (XVIII)

FOSSIL STEMS (2 specimens), from Ozark Mountains.
C. F. BROWN, Hot Springs, Arkansas. 16260. '85. (XIV)

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* Received from the New Orleans Exposition.

SMOKY QUARTZ, quartz crystals, quartz and hematite, wavellite on quartzite, wavellite on a quartz crystal, limonite pseudomorph after pyrite, melanite in magnetite, paramorphs of rutile after arkansite, and quartz pseudomorphs.
C. F. BROWN, Hot Springs, Arkansas. 16260. '85. (XVI)

ZEBRA, *Equus burchelli*, in the flesh.
BARNUM, BAILEY & HUTCHINSON, Bridgeport, Connecticut. 16261. '85. (IV)

COMMON CARROT, *Daucus carota*, L.
Mrs. J. A. HENSHALL, Cynthiana, Kentucky. 16262. '85. (XV)

CALLINECTES with oyster attached.
SAMUEL P. WALTER, Washington. 16263. '85. (XI)

BLUE STONE COKE, from West Virginia.
Maj. JED. HOTCHKISS, Staunton, Virginia. 16264. '85. (XVIII)

STONE MORTAR, from Allenton, Alabama.
L. C. JOHNSON, U. S. Geological Survey. 16265. '85. (III)

CALCITE AND HEMATITE, and quartz containing magnetite and mica.
W. H. STEPHENS, Hiner, Texas. 16266. '85. (XVI)

LAND TORTOISE, for examination.
FRANK C. PRESCOTT, Tombstone, Arizona. 16267. '85. (VI)

BIRDS, from Southern Mexico. *Mimus polyglottos*, *Campylorhynchus brunneicapillus* (2 specimens), *Basileuterus rufifrons*, *Piranga hepatica*, *Carpodacus rhodocolpus*, *Peucæa mexicana*, *Poocætes confinis*, *Pipilo fuscus*, *Sturnella mexicana*, *Icterus parisorum*, *Icterus cucullatus*, *Pyrocephalus mexicanus*, *Centurus aurifrons*, *Coccyzus americanus*, *Ceryle americana*, *Asio wilsonianus*, *Circus hudsonius*, *Parabuteo harrisi*, *Melopelia leucoptera*, *Totanus melanoleucus*, *Recurvirostra americana*, *Ionornis martinica*, *Chaulelasmus streperus*, *Mareca americana*, *Aythya vallisneria*, *Æchmophorus clarkii*, *Speotyto hypogæa* (28 specimens, 27 species).
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (V, A)

BIRDS' EGGS, *Campylorhynchus brunneicapillus*.
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (V, B)

MEXICAN JACANA, *Parra gymnostoma* (skeleton).
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (XII)

PLANTS, for identification.
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (XV)

BATS, *Vespertilio albescens* (27 specimens), and cast of a tooth of *Hipparion*.
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (IX)

FISHES, *Amiurus dugesii*, *Myxostoma austrinum*, *Goodea atripinnis*, *Zophendum australe*, *Exocætus*, *Diodon liturosus*; also a bill of starfish, *Pristis*.
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (VII)

OPAL (21 small pieces).
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (XVI)

CORAL, starfish, and sea urchins.
Prof. ALFRED DUGÈS. Guanajuato, Mexico. 16268. '85. (XI)

REPTILES.
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (VI)

MOLLUSKS, *Cypræa cervina* Lam., *C. albuginosa* Gray, *Busycon perversum* L., *Tivela planulata* Sby., *Ostrea iridescens* Gray (variety), and operculum of *Fasciolaria princeps*, Sby.
Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (IX)

AMALGAM, taken from the stomach of a mule working at a mine. "These mules acquire the habit of licking up the salty sediments which they tread under foot. After death, lumps of amalgam, sometimes weighing several pounds, are often found in the abdominal cavity."*

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (XVIII)

INSECTS. A collection containing larvæ and pupæ, cocoons, nest, and 4 imagos of *Clisiocampa incurva* H. Edw., pupa shell of *Cicada* sp., *Stenopelmatus* sp., *Tenebrionid* larva, near *Centronopus calcarata*, *Metriopelma breyeri*, *Epeira mammata* (?), *Lycosa* sp., *Heteropoda rentoria*, *Attus* sp. (?), *Attus smaragdeus*, *A. cardinalis*, *Phrynis semilunaris* Koch, *Acrosoma spinosa* Hentz, and *A. rugosa*, from Mexico.

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16268. '85. (X)

DIODON, caught in a trap set for cunners.

W. A. WILCOX, Gloucester, Massachusetts. 16269. '85. (VII)

COMMON MOLE, *Scalops aquaticus*, and Bat, *Vespertilio carolii*.

J. and C. WALKER, Olney, Illinois. 16270. '85. (IV)

REPTILES, *Bascanium constrictor*, *Heterodon*, *Ophibolus*, *Tropidonotus*, *Eutænia*, *Cyclophis*, *Coluber*, *Rana*, and *Bufo*.

J. and C. WALKER, Olney, Illinois. 16270. '85. (VI)

BARRED OWL, *Syrnium nebulosum alleni*, juv. New to the National Museum collection.

J. H. BATTY and E. C. GREENWOOD (through Robert Ridgway). 16271. '85. (V, A)

NODULE OF PYRITE altering into Limonite; for examination.

JOHN J. CHIPLEY, Moorefield, Hardy County, West Virginia. 16272. '85. (XVI)

FUNGUS, *Polyporus*, cut from surface of a hickory.

J. B. DEATHERIDGE, Flint Hill, Virginia. 16273. '85. (XV)

STONE CARVING (cast), in shape of human head. A very remarkable specimen. (Original returned.)

NATURAL SCIENCE ASSOCIATION, Staten Island, New York. 16274. '85. (III)

STURGEON, *Acipenser brevirostris*. (Skeleton.)

(Donor unknown). 16275. '85. (XII)

ALTERED SANDSTONE and shales containing particles of mica, also fossil coral; for examination.

FRANK HEREFORD, Union, Monroe County, West Virginia. 16276. '85. (XV)

SANDSTONE, polished one side by glacial or other action, from Newfoundland.

WILLARD NYE, Jr., New Bedford, Massachusetts. 16277. '85. (XVII)

SCAPHOID and cuneiform magnum from the right hock (tarsus) of *Equus caballus*.

A. E. ANDERSON, Boulder, Colorado. 16278. '85. (IV)

ELASTIC, a piece 11½ inches long taken from a mackerel in whose flesh it was nearly all imbedded.

I. C. YOUNG, Wellfleet, Massachusetts (through W. A. Wilcox). 16279. '85. (I)

BAT, *Vespertilio serotinus*.

MIDDLETON SMITH, Washington, District of Columbia. 16280. '85. (IV)

BEETLE, *Creophilus villosus*.

Dr. T. H. BEAN, U. S. National Museum. 16281. '85. (X)

MICE AND SHREWS, *Sorex* sp., *Hesperomys leucopus*, and *Arvicola riparius*, from Patchogue, Long Island.

Dr. T. H. BEAN, U. S. National Museum. 16281. '85. (IV)

MUSK-RAT, *Fiber zibethicus*, from Bainbridge, Pennsylvania.

F. G. GALBRAITH, Wrightsville, Pennsylvania. 16282. '85. (IV)

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* Translation of a portion of a letter from Professor Dugès accompanying the collection.

OLD SQUAW DUCK, *Harelda hyemalis*, from Piney Point, Maryland.
H. M. SMITH, U. S. National Museum. 16283. '85. (V, A)

QUARTZ CRYSTALS, and quartz crystals containing bubbles (396 specimens, 103 pieces), from near Hot Springs.
W. W. MORRISON, Little Rock, Arkansas. 16284. '85. (XVI)

SALTS obtained by boiling water from a well.
M. E. MORGAN, Gratz, Owen County, Kentucky. 16285. '85. (XVI)

SILICEOUS SANDSTONE, for examination.
T. F. KUMMERFIELD, Minden, Iowa. 16286. '85. (XIII, A)

PONDWEED, *Potamogeton natans* L.; for examination.
BENNETT B. GOODMAN, Covington, Tennessee. 16287. '85. (XV)

MOLARS of a horse, and Epiphysis of the humerus, probably of a horse or cow.
JOHN H. CAMP, Herring, Allen County, Ohio. 16288. '85. (IV)

SPHALERITE CRYSTALS on magnesian limestone.
JOHN H. CAMP, Herring, Allen County, Ohio. 16288 '85. (XVI)

CYATHOPHYLLOID CORAL, Silurian.
JOHN H. CAMP, Herring, Allen County, Ohio. 16288. '85. (XIII, B)

INSECT, *Nephela pleonipes*.
R. S. OWEN, Tuscaloosa, Alabama. 16289. '85. (X)

STONE CARVINGS, pottery, copper ax, and obsidian.
LOUIS H. AYMÉ, Oaxaca, Mexico. 16290. '85. (III)

WESTERN BULL SNAKE, *Pityophis elejans*.
GUSTAV EISEN, Fresno City, California. 16291. '85. (VI)

FISHES, *Carapus* sp., and *Fundulus platycephalus*.
GUSTAV EISEN, Fresno City, California. 16291. '85. (VII)

FISHES,* a collection of Cuban species, including many types.
FELIPE POEY, Havana, Cuba. 16292. '85. (VII)

ALEUTIAN WALLET, from Alta Island.
Dr. T. H. BEAN, U. S. National Museum. 16293. '85. (II, B)

GOLD AND COPPER ORES, corundum, and coal.
Col. P. M. WILSON, Raleigh, North Carolina. 16294. '85. (XVIII)

BUILDING STONES and adobe.
F. E. ROESLER, Dallas, Texas. 16295. '85. (XVII)

ELEPHANT, *Elephas indicus*, adult.
BARNUM, BAILEY & HUTCHINSON, Keene, New Hampshire. 16296. '85. (IV)

LIMESTONE, for examination.
Hon. FRANK HEREFORD, Union, Monroe County, West Virginia. 16297. '85. (XVIII)

EGG CASE of mollusk, *Busycon carica*; for examination.
J. L. MCCALEB, Benton, Texas. 16298. '85. (IX)

ORE, for examination.
Hon. C. M. SHELLEY, Washington. 16299. '85. (XVIII)

FOSSILS, *Delphyris lynx*, Eichwald (2 specimens), *Orthis testudianaria*, Dalman (4 specimens), *Leptæna deltoidea*, Cox (3 specimens), and *Zygospira recurvirostra*, Hall (5 specimens). From Trenton Falls, New York.
R. E. C. STEARNS, U. S. National Museum. 16300. '85. (XIII)

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* For further information concerning this accession, see report on department of fishes, p. 168.

IRON ORE containing manganese, several rocks, chromo iron ore, rock containing chromium and antimony.
JOHN W. MCGEE, Seattle, Washington. 16301. '85. (XVI)

BLACK CHINNED SPARROW, *Spizella atrigularis* (6 specimens): and plumed quail, *Oreortyx picta* (2 specimens). A very valuable contribution, nearly doubling the Museum series of the former species.
FOREST BALL, San Bernardino, California. 16302. '85. (V, A)

NEST and eggs (2) of Swainson's Warbler, *Helinaia swainsonii*. The first ever collected. (Purchased.)
WILLIAM BREWSTER, Cambridge, Massachusetts. 16303. '85. (V, B)

KING SNAKE, *Ophibolus getulus*, from the District of Columbia.
H. W. HENSHAW, U. S. Geological Survey. 16304. '85. (VI)

WATER from an artesian well.
J. SIMONSON, Gainesville, Florida. 16305. '85. (XVI)

INSECT, from Mississippi.
16306. '85. (X)

MARINE SHELLS (10 species), from the west coast of Madagascar.
Lieut. M. A. SHUFELDT, U. S. Navy. 16307. '85. (IX)

MOLYBDENITE, for examination.
OVERHOLT and TRUE: Salides, Colorado. 16308. '85. (XVIII)

FRESH-WATER AND MARINE SHELLS, from Kodiak, collected by W. J. Fisher.
R. E. C. STEARNS, U. S. National Museum. 16309. '85. (IX)

AMERICAN HERCULES BEETLE, *Dynastes tityus*, Linn.
JOHN S. WEBB: Disputanta, Virginia. 16310. '85. (X)

ETHNOLOGICAL OBJECTS, from Japan. (Exchange.)
BUREAU OF EDUCATION, Tokyo, Japan. 16311. '85. (I, A)

KANGAROO, *Halmaturus bennetti*, in the flesh.
ZOOLOGICAL SOCIETY OF PHILADELPHIA. (Through Arthur Edwin Brown, Esq.) 16312. '85. (IV)

DANALITE, cyrtolite, cryophyllite, annite, fergusonite, magnetite, fluorite, hematite, amazon-stone and orthoclase. (Exchange.)
WILLIAM J. KNOWLTON, Boston, Massachusetts. 16313. '85. (XVI)

TOBACCO HOGSHEAD and frame, used in Virginia in 1780; weight 375 pounds.
Judge A. H. HAGNER, Washington. 16314. '85. (II, A)

BILL-FISH, *Tetrapturus albidus*, from Rhode Island.
JOSEPH WHARTON, Newport, Rhode Island. 16315. '85. (VII)

HORN-TAIL, *Tremex columba*, Linn.
W. L. WILLIAMS, Windsor, North Carolina. 16316. '85. (X)

SCORPION, *Spectrum mygale*, larva of sphinx, and 2 species of ants.
Dr. J. F. BRANSFORD, U. S. Navy (through A. G. Menocal, C. E.). 16317. '85. (X)

FISHES, *Tetragonopterus fasciatus*, from Nicaragua.
Dr. J. F. BRANSFORD, U. S. Navy (through A. G. Menocal, C. E.). 16317. '85. (VII)

WING AND CREST of *Crax globicera* ♀, from Nicaragua.
Dr. J. F. BRANSFORD, U. S. Navy (through A. G. Menocal, C. E.). 16317. '85. (V, A)

REPTILES, *Helicina* sp. (6 specimens), from Nicaragua.
Dr. J. F. BRANSFORD, U. S. Navy (through A. G. Menocal, C. E.). 16317. 85. (VI)

ARCHÆOLOGICAL OBJECTS, flint hammer-stones, flint cores, rude implements, cutting and drilling tools, and a large anvil-stone; from Licking County, Ohio.
KY. Q. SMITH, Augusta, Kentucky. 16318. '85. (II, A)

BIRD-SKINS (50 specimens, 41 species), from various localities. (Exchange.)
CHARLES K. WORTHEN, Warsaw, Illinois. 16319. '85. (V, A)

BAG-WORM, *Thyridopteryx ephemeræformis*.
S. O. DEOVER, Washington. 16320. '85. (X)

FISHES, *Pinguipes*, *Arius*, *Tylosurus*, *Polynemus*, and head, tail and dorsal fin of *Promicrops*, from Central America.
Dr. W. H. JONES, U. S. Navy. 16321. '85. (VII)

WATER SNAKE, from Panama.
Dr. W. H. JONES, U. S. Navy. 16321. '85. (VI)

MYTILUS, *Tapes*, *Turpura*, *Leucozoina*, etc., from Panama, Peru and Chili.
Dr. W. H. JONES, U. S. Navy. 16321. '85. (X)

IRON PYRITE in cubes.
L. M. CLEMENTS, Centreville, Alabama. 16322. '85 (XVIII)

PLANT, probably *Bouvardia ovata*, Gray.
N. A. THOMSON, Victoria, Texas. 16323. '85. (XV)

SIBERIAN TITMOUSE, *Parus cinctus* (2 skins), from Yenesai, east Siberia, the first specimens received from that country.
HENRY SEEBOHM, London, England. 16324. '85. (V, A)

MODELS OF LIGHT-HOUSES, light-ships, coffer-dam, crib, Minot's ledge, etc., exhibited at New Orleans Exposition.
LIGHT-HOUSE BOARD, United States Treasury Department. 16325. '85. (I)

CRYSTALS OF PYRITE with dirt, hard clay carrying cubes of pyrites, and decomposed material colored black by manganese, for examination.
W. H. ROBINSON, Mariposa, California. 16326. '85. (XVII)

BIRD-SKINS, *Pelionetta perspicillata*, *Colymbus auritus* and *Ptycorhamphus aleuticus*, from California.
JOHN MULLAN, Washington, District of Columbia. 16327. '85. (V, A)

MINK, *Putorius vison*; Oregon Mole, *Scapanus townsendii*, and Bat, *Nyctimomus macroti* (skins).
JOHN MULLAN, Washington, District of Columbia. 16327. '85. (IV)

MOLLUSK, *Chiton kennerlyi*, from California.
JOHN MULLAN, Washington, District of Columbia. 16327. '85. (IX)

SPIDER belonging to the *Tarantuloidæ* and *Prionus californicus*, Mots.
JOHN MULLAN, Washington, District of Columbia. 16327. '85. (IX)

CRABS (2 specimens) and shell covered with coral, from California.
JOHN MULLAN, Washington District of Columbia. 16327. '85. (XI)

STONE IMPLEMENTS, pipes, gorgets, etc. (6 specimens). Returned.
Mrs. MARY E. BUTLER, Chillicothe, Ohio. 16328. '85. (III)

ACADIAN FLYCATCHER, *Empidonax acadicus* (skin), for identification.
JOHN E. OTTAWAY, Amsterdam, New York. 16329. '85. (V, A)

ROCK, for examination.
JOHN T. WHITLOCK, Brandon, Vermont. 16330. '85. (XVIII)

PHOTOGRAPHS of Rosa White Thunder (to show costume), (3 boudoir, 1 negative and 1 cabinet).
INDIAN INDUSTRIAL SCHOOL, Carlisle, Pennsylvania (through Capt. R. H. Pratt, U. S. A.). 16331. '85. (II, A)

GRECIAN BOWL, from a tomb in Ephesus, and Grecian costume found in a cavern in the castle on the island of Kalymnos, Asia Minor. Probably nine centuries old. (Deposited.)

N. CARANDONIS, Kalymnos, Turkey. 16332. '85. (II, A)

SEEDS of the following plants: *Olearia* sp. *Alectryon excelsum*, *Solanum auriculare*, *Myoporum Lætane*, *Veronica elliptica*, *Corynocarpus lavigata*, *Areca sapida*, *Pittospermum Buchanani*, *Leptospermum scoparium*, *Cordyline Australis*, *Lophosa tetraptera*, *Pittospermum tenuifolium*.

Dr. WILLIAM F. HOLCOMBE, New York, New York. 16333. '85. (XV)

FISH, *Coryphæna punctulata* (skeleton), taken in the North Atlantic.

U. S. FISH COMMISSION. 16334. '85. (XII)

FISH, *Caranx pisquetus* (2 skeletons).

ISAAH SPINDEL, Woods Holl, Massachusetts. 16335. '85. (XII)

FERRUGINOUS QUARTZ, containing crystals of quartz and scales of hematite.

JAMES A. WARD, Heth, Douglas County, Missouri. 16336. '85. (XVIII)

PLANTS. A very valuable general collection, containing more than a thousand species; mainly from the West.

WILLIAM M. CANBY, Wilmington, Delaware. 16337. '85. (XV)

DECOMPOSED ORE.

GEORGE W. KITTERMAN, Heth, Douglas County, Missouri. 16338. '85. (XVIII)

SAMUELS' SONG SPARROW, *Melospiza fasciata samuelis* (8 skins); California Song Sparrow, *M. heermanni* (2 skins); Snowy Plover, *Ægialitis nivosa* (2 skins); California Clapper Rail, *Rallus obsoletus* (3 downy young); and Cassin's Auk, *Ptycorhamphus aleuticus* (2 skins).

W. OTTO EMERSON, Haywards, California. 16339. '85. (V, A)

PARASITIC WORM, taken from a rock-cod.

Dr. W. H. RUSH, U. S. Coast Survey. 16340. '85. (XI)

TOOTH OF HORSE, found in a virgin forest near Lenoir, N. C., with similar objects, and pottery, etc.

J. M. SPAINHOUR, Lenoir, North Carolina. 16341. '85. (III)

DAMOURITE, margarite, tourmaline, vermiculite, corundum, albite, ripidolite, spinel, phlogopite, picrolite, serpentine and drusy quartz; from Chester County, Pennsylvania.

H. M. INGRAM, U. S. National Museum. 16342. '85. (XVI)

MOUNTAIN SHEEP, Black-tailed deer (2 specimens), Alpaca sheep, Llama, Chinese sheep, Spotted hyena, Black bear, Mule deer, Three prong-horn antelopes, Mule antelope, Peccary, lynx and dog; (23 skins) from various localities.

MUSEUM OF COMPARATIVE ZOOLOGY, Cambridge, Massachusetts (through A. Agassiz). 16343. '85. (IV)

PREHENSILE-TAILED PORCUPINE, *Synetheres mexicana*, in the flesh.

W. A. CONKLIN, Central Park Menagerie, New York City. 16344. '85. (IV)

REPTILES, *Desmognathus nigra*, *Tropidonotus sipedon*, *Bufo americanus*, *Spelerpes ruber*, and *Chelydra serpentina* (9 specimens); from Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16345. '85. (VI)

SUNFISHES, darters, bass, minnows, trout, suckers, fresh-water sculpins; from Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16345. '85. (VII)

CRAYFISHES, worms, and amphipods; from Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16345. ('85). (XI)

FUNGUS, from Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16345. '85. (XV)

INSECTS, from Virginia.
Col. M. MCDONALD, U. S. Fish Commission. 16345. '85. (IX)

FOSSIL ARGONAUTA in indurated clay, from Lower California.
C. R. ORCUTT, San Diego, California. 16346. '85. (XIII, A)

LARVA of *Gasteropacha* sp. found under a live-oak tree near Atlantic coast.
F. W. LACHICOTTE, Waverly Mills, Georgetown, South Carolina. 16347. '85. (X)

INSECT, *Rhyssa atrata*, ♀.
M. C. LEACH, Nineveh, Virginia. 16348. '85. (X)

SANDSTONE containing carbonaceous matter and scales of mica.
W. A. ELLIS, Saint Albans, West Virginia. 16349. '85. (XVIII)

FUNGUS, order *Hymenomycetes*, probably *Agaricus chrysophyllus* Fr., hollow stem.
JOHN SUTHERLAND, 64 Liberty street, New York. 16350. '85. (XV)

LUMBRICOID WORM.
L. O. HOWARD, Department of Agriculture. 16351. '85. (XI)

FOSSILIFEROUS LIMESTONE, for examination.
AYERS and HARDMAN, White Pine, West Virginia. 16352. '85. (XVI)

FOSSILS.
Dr. J. C. NEAL, Archer, Fla. (through Geological Survey). 16353. '85. (?)

FISHES.*
IMPERIAL ACADEMY OF SCIENCES, St. Petersburg, Russia. 16354. '85. (VI)

SANDSTONE bearing impressions, probably of sticks and grasses.
C. A. HIRSCHFELDER, Toronto, Canada. 16355. '85. (III)

IMPURE FELDSPAR.
P. S. REXIBUS, Doan's, Texas. 16356. '85. (XVI)

IRON PYRITES.
R. B. SANDLIN, Balloon, Arkansas. 16357. '85. (XVI)

BOWS AND ARROWS, and tools used by Shasta Indians in making same. (Purchased.)
L. W. GREEN, Baird, Shasta County, California. 16358. '85. (II, A)

LARVÆ of *Datana ministra*.
J. C. CATLIN, Ravenna, Ohio. 16359. '85. (X)

REPTILES, including representations of *Bufo*, *Rana*, *Amblystoma*, *Phrynosoma*, *Sceloporus*, and *Eumeces fasciatus* (382 specimens).
Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 16360. '85. (VI)

BIRD SKINS; borrowed for study and returned.
GEORGE N. LAWRENCE, New York City, New York. 16361. '85. (V, A)

ROCKWOOD POTTERY (6 specimens). (Exchange.)
WOMEN'S ART MUSEUM ASSOCIATION, Cincinnati, Ohio. 16362. '85. (II, B)

WATER MOCCASIN, *Tropidonotus sipedon*, from District of Columbia, and box tortoise, *Eutænia sirtalis dorsalis*, from Fairfax County, Virginia.
L. M. TURNER, Smithsonian Institution. 16363. '85. (VI)

INSECTS (1,103 specimens).
Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 16364. '85. (X)

ROYAL HORNED CATERPILLAR, *Citheronia regalis*, uncommon in Illinois.
E. B. HOKE, Cordova, Illinois. 16365. '85. (X)

PREHENSILE-TAILED PORCUPINE, *Synetheres mexicanus*, in the flesh.
W. A. CONKLIN, Central Park, New York. 16366. '85. (IV)

GARNETS from Shantung Province, China; found in bed of stream.
DR. J. L. HOLDMES. 16367. '85. (XVI)

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* For further information concerning this accession see Report on Department of Fishes, page 169.

GARNET found in the bed of a small stream in the vicinity of Fungchow, Shantung Province, China.
Dr. J. L. HOLMES (through O. T. Mason). 16368. '85. (XVI)

TOURMALINE (3 specimens), from Minas Geraes, Brazil; model of a diamond crystal; crystals of feldspar (3); pseudomorph after leucite, from Magnet Cove, Arkansas.
GEORGE F. KUNZ, Hoboken, New Jersey. 16369. '85. (XVI)

CANCRINITE, elæolite, sodalite (109 specimens), from Litchfield, Maine. (Exchange.)
Mrs. A. C. MERCHANT, South Litchfield, Maine. 16370. '85. (XVI)

SCOTCH SNUFF used for "dipping" in the Southern States, said to contain a mild alkali, intended to counteract the acid secretions of the mouth. (Purchased.)
IVERY, OWEN & CO., Lynchburgh, Virginia (through W. F. Page). 16371. '85. (II, A)

LIZARD and small snake, from Point Reyes, California.
Dr. C. HART MERRIAM, Sing Sing, New York. 16372. '85. (VI)

FISH. Fœtal viviparous perch, *Embiotocoid*, from Point Reyes, California.
Dr. C. HART MERRIAM, Sing Sing, New York. 16372. '85. (VII)

CUBAN PARROT, *Chrysotis leucocephala*, in the flesh.
W. C. WEEDEN, U. S. National Museum. 16373. '85. (V, A)

PIPE made of mottled stone. (Exchange.)
D. S. CARVIN, Lyons, Ohio. 16374. '85. (III)

WHITNEY'S PIGMY OWL, *Micrathene whitneyi*, from Tucson, Arizona.
ZOOLOGICAL SOCIETY OF PHILADELPHIA (through Arthur Edwin Brown, Esq.). 16375. '85. (V, A)

BROWN-HEADED NUTHATCH, *Sitta pusilla* (3 specimens), and Western Sandpiper, *Ereunetes occidentalis* (3 specimens).
H. M. SMITH, U. S. National Museum. 16376. '85. (V, A)

NEST AND EGGS of Traill's and Acadian Flycatchers, *Empidonax traillii* and *E. acadicus*.
Dr. J. C. MERRILL, U. S. Army, Columbus Barracks, Ohio. 16377. '85. (V, B)

EGGS of Franklin's Gull, *Larus franklinii* (3 sets). (Exchange.)
J. W. PRESTON, Baxter, Iowa. 16378. '85. (V, B)

SHALE found in conglomerate and millstone grit, for examination.
NEWTON DUNYON, Tooele City, Utah. 16379. '85. (XVII)

ARROWHEADS (10), scrapers (2), and leaf-shaped implements (2).
K. Q. SMITH, Augusta, Kentucky. 16380. '85. (III)

INSECT. 16381. '85. (X)

PHOTOGRAPHS (10 small plates) of flint implements found at Hakodate, island of Jesso.
E. AMSDEN, Yokohama, Japan. 16382. '85. (III)

BATS.
H. L. PRESTON, 2 College avenue, Rochester, New York. 16383. '85. (IV)

GREEN HERON, *Butorides virescens* (skin), from District of Columbia.
CLARENCE BURKE, 710 H street, Washington. 16384. '85. (V, A)

CUBAN PARROTS, *Chrysotis leucocephala* (4 specimens), in the flesh.
W. C. WEEDEN, U. S. National Museum. 16385. '85. (V, A)

INSECTS, *Erastria caudefacta* (1 specimen), *Pyralidæ* (2 specimens), and *Tineidæ* (1 specimen).
HOWARD SHRIVER, Wytheville, Virginia. 16386. '85. (X)

RED BAT, *Atalapha noveboracensis*, in the flesh.
C. A. STEUART, Smithsonian Institution. 16387. '85. (IV)

PLUMBAGO and products from the graphite works, Bloomingdale, New Jersey.
BLOOMINGDALE GRAPHITE COMPANY, Bloomingdale, New Jersey. 16388. '85. (XVIII)

BIRDS (35 species, 48 specimens). Several species new to the collection, from various localities.

H. K. COALE, Chicago, Illinois. 16389. '85. (V, A)

MISPICKEL, or arsenical pyrite, from Harney Peak district, Dakota.

SAMUEL SCOTT, Rapid City, Dakota. 16390. '85. (XVIII)

QUARTZ, impure feldspar, and hornblende.

J. G. SETTLES, Doans, Texas. 16391. '85. (XVI)

INDIAN STRAINER used by Apache Indians in the preparation of "tiswin," an intoxicating drink made from the mescal plant.

Maj. B. J. D. IRWIN, U. S. Army, Whipple Barracks, Arizona. 16392. '85. (II, A)

QUARTZ CRYSTAL, and two groups of quartz crystals, from Natural Bridge, Virginia.

MYRON B. W. HOUGH, Washington, District of Columbia. 16393. '85. (XVI)

SERPENTINE ORNAMENT, from San Francisco, California.

R. E. C. STEARNS, U. S. National Museum. 16394. '85. (XVI)

CRANIA (313) AND SKELETONS (322) representing North American vertebrates, and including birds, mammals, fishes, and reptiles. (Exchange.)

ARMY MEDICAL MUSEUM, Washington, District of Columbia, through Dr. John S. Billings, U. S. A., Curator. 16395. '85. (XII)

ALUMINUM, illustrating the Frishmuth process of extracting this material from its ores.

Col. WILLIAM E. FRISHMUTH, Philadelphia, Pennsylvania. 16396. '85. (XVIII)

RICHARDSON'S SPERMOPHILE, *Spermophilus richardsoni*.

CHARLES RUBY, Fort D. A. Russell, Wyoming Territory. 16397. '85. (IV)

INSECT; for examination and report.

JOHN C. SCHERMERHORN, Council Bluffs, Iowa. 16398. '85. (X)

FOSSIL COAL.

COURT HAMILTON, Bunker Hill, West Virginia. 16399. '85. (XIV)

INSECTS, from Wytheville, Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16400. '85. (X)

CRUSTACEA, from Wytheville, Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16400. '85. (XI)

MAMMALS, *Vesperugo georgianus* (2 specimens), from Wytheville, Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16400. '85. (IV)

BAT, *Nyctinomus brasiliensis*, from Mexico.

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16401. '85. (IV)

FISHES, from Mexico.

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16401. '85. (VII)

COLEOPTERA, from Mexico.

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16401. '85. (X)

BIRDS, *Icterus cucullatus* ♀, *Xanthocephalus xanthocephalus*, *Dendroica æstiva*, *Phainopepla nitens*, *Calamospiza bicolor*, *Sayornis nigricans*, *Crotophaga ani*, *Ortyx graysoni*, *Falco sparverius*, *Accipiter fuscus*, *Rhyacophilus solitarius* (11 specimens, 11 species).

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16401. '85. (V, A)

DEVIL FISH, probably *Octopus punctatus* Gabb., from western coast of Mexico.

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16401. '85. (IX)

PLANTS (sent to S. Watson, Harvard University, for identification).

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16401. '85. (XV)

REPTILES, *Elaps fulvius*, *Eutænia pulchrilatus*, and *E. sirtopis*, from Mexico.

Prof. ALFRED DUGÈS, Guanajuato, Mexico. 16401. '85. (VI)

FOSSIL, *Baculites ovatus* Say, from the Colorado group of the Cretaceous.

Miss MAY HALSTED, Lexington, Mississippi. 16402. '85. (XIII, A)

INSECT, Theraphosoid, probably new.
J. B. BOWMAN, Aleman, New Mexico. 16403. '85. (X)

FLEXIBLE SANDSTONE.
S. M. DUGGER, Banner's Elk, Watuaga County, North Carolina. 16404. '85. (XVII)

KELP PARCHMENT, prepared for printing; the first made in the United States.
JAMES G. SWAN, Port Townsend, Washington. 16405. '85. (I)

KAOLIN (2 specimens), bog iron ore (2 specimens), and compact limonite (44 specimens).
FRANK BURNS, U. S. Geological Survey. 16406. '85. (XVI)

SPIDER, *Epeira*, probably *viratica*.
LEWIS R. GIBBS, Jr., 28 Corning street, Charleston, South Carolina. 16407. '85. (X)

INSECTS (13 vials), from Panama.
Dr. GEORGE W. NELSON, Mazatlan, Mexico, and Dr. WOLFRED NELSON, New York City, New York. 16408. '85. (X)

REPTILES, *Bufo* (1 specimen), and *Dendrobates tinctorius* (4 specimens), from Panama.
Dr. GEORGE W. NELSON, Mazatlan, Mexico, and Dr. WOLFRED NELSON, New York City, New York. 16408. '85. (VI)

BIRD, *Trochalopteron rufigulare*, a species of *Timeliidæ*, from the Himalaya Mountains. New to the collection.
GEORGE N. LAWRENCE, New York, New York. 16409. '85. (V, A)

DAMOURITE, lepidolite, cookeite, cleavlandite, triphylite, lepidomelane, tripolite, topaz, beryl, tourmaline, zircon, muscovite, apatite, vesuvianite, cassiterite, gahnite, columbite, etc. (40 specimens).
N. H. PERRY, South Paris, Maine. 16410. '85. (XVI)

INSECT, "Walking-stick," *Diapheromera femorata*.
WILLIAM REAR, Nashville, Tennessee. 16411. '85. (X)

PLANT, Black Knot, *Sphæria morbosa*, also *Polyporus* sp.
Mrs. M. E. WING, Charlotte, Vermont. 16412. '85. (XV)

ETHNOLOGICAL OBJECTS: Shoes, slippers, stockings, brass penholder, inkstand and reed pens, fez caps, cotton skull-caps, hubble-bubble pipe, long pipe-stem, pipe-bowls, paper lantern, shepherd's sheepskin coat, Mohammedan charm, etc., from Egypt and the Holy Land.
OTIS BIGELOW, Washington, District of Columbia. 16413. '85. (II, A)

MAMMALS, *Lynx rufus* and *Cynomys ludovicianus* (skins).
CHARLES K. WORTHEN, Warsaw, Illinois. 16414. '85. (IV)

CRAYFISHES, from Wytheville, Virginia.
Col. M. MCDONALD, U. S. Fish Commission. 16415. '85. (XI)

FUNGUS, from Wytheville, Virginia.
Col. M. MCDONALD, U. S. Fish Commission. 16415. '85. (XV)

INSECTS, from Wytheville, Virginia.
Col. M. MCDONALD, U. S. Fish Commission. 16415. '85. (X)

SHELLS, *Physa heterostropha* Say, from Wytheville, Virginia.
Col. M. MCDONALD, U. S. Fish Commission. 16415. '85. (IX)

REPTILES, *Coluber obsoletus*, *Tropidonotus sipedon*, *Carphophiops amœnus*, *Rana catesbiana*, *Bascanium constrictor*, *Desmognathus fusca*, and *Spelerpes longicaudus*, from Wytheville, Virginia.
Col. M. MCDONALD, U. S. Fish Commission. 16415. '85. (VI)

QUARTZ (2 specimens), quartzite, shale, chlorite, and menaccanite (2 specimens), from Loudoun County, Virginia.
F. W. TRUE, U. S. National Museum. 16416. '85. (XVII)

SEALS, *Phoca grœnlandica* (2 skins).
Dr. C. HART MERRIAM, Locust Grove, New York. 16417. '85. (IV)

BIRDS, *Turdus pallasi*, *Vireo olivaceus*, *Myiarchus crinitus*, *Empidonax flaviventris*, *Contopus virens*, *Sphyropicus varius* (7 specimens), from New Hampshire.
W. H. FOX, Washington, District of Columbia. 16418. '85. (V, A)

IMPURE QUARTZ, containing pyrite and sphalerite.
D. W. M. WRIGHT, Holly Brook, Bland County, Virginia. 16419. '85. (XVI)

INSECTS, *Macro-lepidoptera* (20 species), collected in California by Mr. Charles Fuchs, of San Francisco.
JOHN B. SMITH, U. S. National Museum. 16420. '85. (X)

COPPER ORNAMENT, from a mound in Greenup County, Ky.
W. KINNEY, Scioto County, Ohio. 16421. '85. (III)

PISOLITE AND OÖLITE, and concretionary forms of calcite.
A. B. QUINAN, Dillon, Montana. 16422. '85. (XVI)

ROCKS. (Exchange.)
H. M. MALLING, Portland, Maine. 16423. '85. (XVII)

FOSSIL PLANTS, from the coal-measures of Indiana, and casts of plants in coal.
FLETCHER M. NOE, 130 East New York street, Indianapolis, Indiana. (Sent to Professor Lesquereaux.) 16424. '85. (XIV)

CHALCOCITE, bornite, quartz, chalcopyrite, calcite, clay, copal and strontianite (45 specimens).
GOVERNMENT OF COSTA RICA (through L. C. Quintero, United States vice-consul). 16425. '85. (XVI)

RATTLESNAKE, *Crotalus confluentus* (skin, without head), from Colorado.
Miss DOTTIE BLACKBURN (through Col. J. Stevenson). 16426. '85. (VI)

DIABASE, from Lewiston, Maine.
GEORGE P. MERRILL, U. S. National Museum. 16427. '85. (XVII)

LIMESTONE CONGLOMERATE, from West Virginia.
FRANK SMITH, Cincinnati, Ohio. 16428. '85. (XVIII)

EAR OF RABBIT, *Lepus* sp., with three abnormal horny growths upon it.
G. HILLJE, Schulenburgh, Texas. 16429. '85, (IV)

CEREMONIAL OBJECT of stone nearly rectangular, from Madison County, Indiana, and ceremonial weapon resembling a double axe, from Jefferson County, Indiana.
GEORGE SPANGLER, Madison, Indiana. 16430. '85. (III)

BLACK TOURMALINE, from Ashe County, North Carolina.
Donor unknown. 16431. '85. (XVI)

VANADATE OF LEAD, from Zacatecas, Mexico.
Dr. H. G. TORREY, U. S. Mint, New York. 16432. '85. (XVIII)

AURIFEROUS CALCITE.
Col. GEORGE L. SHOUP, Salmon City, Idaho. 16433. '85. (XVIII)

CRYSTALLINE LENS of a *Cephalopod*, from Peru.
GEORGE F. KUNZ, New York, New York. 16434. '85. (IX)

FISH, *Pterophrynoides histrio*, from the Gulf of Mexico.
Rev. Dr. HINSDALE, Biloxi, Mississippi. 16435. '85. (VII)

SILICEOUS CONCRETION.
C. C. HOFFMEISTER, Mossy Creek, Jefferson County, Tennessee. 16436. '85. (XVII)

BIRD-SKINS (29 species, 30 specimens).
Capt. CHARLES E. BENDIRE, U. S. Army, Fort Custer, Montana. 16437. '85. (V, A)

BIRDS' EGGS (24 species), *Oroscoptes montanus*, *Harporhynchus rufus*, *Anthus ludovicianus*, *Icteria virens*, *Leucosticte australis*, *Chondestes grammica strigata*, *Spizella breweri*, *Pipilo maculatus arcticus*, *Zamelodia melanocephala*, *Passerina amœna*, *Calamospiza bicolor*, *Agelaius phœniceus*, *Icterus bullocki*, *Quiscalus purpureus æneus*, *Corvus frugivorus*, *Perisoreus obscurus*, *Eremophila alpestris arcticola*, *Empidonax minimus*, *Colaptes auratus hybridus*, *Coccyzus erythrophthalmus*, *Asio americanus*, *Scops asio maxwelliæ*, *Accipiter cooperi*, *Buteo swainsoni*, with two exceptions, from the vicinity of Fort Custer, Montana.

Capt. CHARLES E. BENDIRE, U. S. Army, Fort Custer, Montana. 16437. '85. (V, B)

NOTCHED SINKER, rude implements (5), cutters (4), and arrowheads (5).

A. F. BERLIN, Allentown, Pennsylvania. 16438. '85. (III).

WATER, for analysis.

EMZY TAYLOR, Georgetown, Texas. 16439. '85. (XVI)

CRUSTACEA, from Waynesborough, Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16440. '85. (XI)

MINNOWS, trout, darters, bass, sunfishes, suckers, etc.; from Waynesborough, Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16440 '85. (VII)

REPTILES, *Rana catesbiana* (2 specimens); from Waynesborough, Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16440. '85. (VI)

SHELLS, immature Vivipara; from Waynesborough, Virginia.

Col. M. MCDONALD, U. S. Fish Commission. 16440. '85. (IX)

SPEAR HEADS (2), and leaf-shaped implements (2), and a copper chisel, of which casts were made in the Museum.

J. L. DEWITT, Newton, Vernon County, Wisconsin. 16441. '85. (III)

ARCHÆOLOGICAL OBJECTS, from France.

THOMAS WILSON, U. S. Consul, Nice, France. 16442. '85. (III)

INSECTS, *Namestra atlantica* Git., *Hadena devastatrix* Brace, *H. dubitans* Walk., *Chrytolita petrealis* Git., *Rioula propinqualis* Gn., from New York.

Dr. C. S. MCKNIGHT, Saranac Lake, New York. 16443. '85. (X)

FERRUGINOUS QUARTZITE.

JAMES P. DICKINSON, Guttenberg, Clayton County, New York. 16444. '85. (XVII)

IRIDOSMINE.

ALLEN D. WOLCOTT, Randolph, Oregon. 16445. '85. (XVIII)

BIRDS, *Sialia arctica*, *Lanius borealis*, *Carpodacus cassini*, *Spinus arizonæ*, *Pipilo megalonyx* *Falco richardsoni*, *Oxyechus vociferus* (9 specimens, 7 species).

Dr. R. W. SHUFELDT, U. S. A. Fort Wingate, New Mexico. 16446. '85. (V, A)

BLACK TERN, *Hydrochelidon surinamensis* (skin) from Tuckanuck Island, Massachusets.

WILLARD NYE, Jr., New Bedford, Massachusetts. 16447. '85. (V, A)

NEST of Blue Grosbeak, *Guiraca cærulea*, from Gainesville, Virginia, with photograph.

R. RIDGWAY, U. S. National Museum. 16448. '85. (V, B)

PAPER made from Indian corn fiber.

SANDERSON SMITH, New Haven, Connecticut. 16449. '85. (I)

NECKLACE of old wampum beads, from Mohawk Indians, New York.

OTIS T. MASON, U. S. National Museum. 16450. '85. (XVII)

SERPENTINE (13 specimens) and basalt (4 specimens), from Hoboken, New Jersey.

GEORGE P. MERRILL, U. S. National Museum. 16451. '85. (XVII)

HEWN PLANKS, illustrating aboriginal methods of lumbering.

MILES ROCK, Panama. 16452. '85. (II, A)

PIED-BILLED GREBE, *Podilymbus podiceps* (head, foot, and wing).
JAMES W. ROGAN, Rodgersville, Tennessee. 16454. '85. (V, A)

COPPER BEADS (6), perforated bear's teeth (2), bone pendants (2), and two pieces of sheet silver which are of special interest, being the first of the kind given to the Museum.
J. L. DE WITT, Newton, Vernon County, Wisconsin. 16455. '85. (VII)

NORTHERN PHALAROPE, *Lobipes lobatus*, and Avocet, *Recurvirostris americana*, in the flesh.
I. B. BOWMAN, Aleman, New Mexico. 16456. '85. (V, A)

DULUTH GABBEO, from Duluth, Minnesota.
Prof. N. H. WINCHELL, Minneapolis, Minnesota. 16457. '85. (XVII)

SQUASH, resembling a duck in shape.
THOMAS SCHLEY and W. T. DELAPLAINE, Frederick, Maryland. 16458. '85. (XV)

CHALCEDONY and drusy quartz on chalcedony.
T. A. BRITT, Jacksonville, Florida. 16459. '85. (XVI)

FISHES, *Semotilus bullaris*, *Amiurus*, *Roccus*, *Fundulus*, *Rhinichthys*, *Hybognathus*, *Boleosoma*, *and Notemigonus*.
BENJAMIN MILLER, Washington, District of Columbia. 16460. '85. (VII)

MOLLUSK, *Tivela crassatelloides*, Conrad, bored by a predaceous mollusk.
JAMES R. TOWNSEND, Los Angeles, California. 16461. '85. (IX)

ALBINO WOODPECKER, *Centurus carolinus*, Linn.
THEO. LIENKNECHT, Oliver Springs, Tennessee. 16462. '85. (V, A)

SORA RAIL, *Porzana carolina*, in the flesh.
T. E. SKINNER, Smithsonian Institution. 16463. '85. (V, A)

EQUINE ANTELOPE, *Hippotragus equinus*, in the flesh.
BARNUM, BAILEY & HUTCHINSON, Bridgeport, Connecticut. 16464. '85. (IV)

HYDRONEPHELITE with sodalite in Elæolite syenite; from Litchfield, Maine.
T. F. LAMB, Portland, Maine. 16465. '85. (XVI)

SKULLS and BONES. 16466. '85. (XII)

LARVA of *Platysamia cecropia*.
C. L. KILMER, Little, Nebraska. 16467. '85. (X)

CANNON AND GUN CARRIAGE made of travertine, from the Rock of Gibraltar.
HORATIO J. SPRAGUE, United States Consul, Gibraltar, Spain. 16468. '85. (XVI)

FISHES, *Siphostoma fuscus*, and *Monocanthus hispidus*.
HERBERT M. KNOWLES, keeper life-saving station, Point Judith, Rhode Island. 16469. '85. (VII)

LARVA of *Phobetron pithecium*, A. & S.
S. D. HASKIN, Waterville, Minnesota. 16470. '85. (X)

SILICEOUS PEBBLE.
CHARLES MILLER, jr., Sanborn, New York. 16471. '85. (XVIII)

BIRD, *Lagopus alpinus*, from Savoy. (Exchange.)
F. A. LUCAS, U. S. National Museum. 16472. '85. (V, A)

SILK KNITTING-MACHINE.
A. A. DULY, U. S. National Museum. 16473. '85. (I)

MEADOW LARK, *Sturnella neglecta*.
GUSTAV EISEN, Fresno, California. 16474. '85. (V, A)

LAMPREY EEL, *Ichthyomyzon*, from Bear Creek, Grayson County, Kentucky.
J. B. MARCOU, U. S. National Museum. 16475. '85. (VII)

WORMS, from Bear Creek, Grayson County, Kentucky.
J. B. MARCOU, U. S. Geological Survey. 16475. '85. (XI)

PUPA of *Lucanus elephas*.
WORTH STICKLEY, Madisonville, Texas. 16476. '85. (X)

CHUCKCHEE CROSS-BOW.
ACADEMY OF NATURAL SCIENCES, Stockholm, Sweden, through F. A. Smith. 16477. '85. (II, A)

BIRD-SKINS from Samoa, as follows: *Strix delicatula*, *Halcyon recurvirostra*, *Eudynamus taitiensis*, *Ptilotis carunculata*, *Myzomela nigriventris*, *Phaëthon flavirostris*, and *Anas superciliosa*. (10 specimens.)
Dr. T. CANISIUS, Chicago, Illinois. 16478. '85. (V, A)

SALTED FISHES AND SHRIMPS.
D. J. MACGOWAN, Wenchow, China. 16479. '85. (I)

ABORIGINAL IMPLEMENTS, material containing pieces of mica, and stone used for making mauls for obtaining mica.
JOHN B. WIGGINS, Chula, Amelia County, Virginia. 16480. '85. (III)

AMERICAN BITTERN, *Botaurus lentiginosus;* from the Potomac marshes, District of Columbia.
T. E. SKINNER, Smithsonian Institution. 16481. '85. (V, A)

MILLERITE, from the "Gap mine," Lancaster, Pennsylvania.
Capt. JOHN WILLIAMS. Lancaster, Pennsylvania. 16482. '85. (XVIII)

"DISH-RAG GOURD," *Luffa ægyptica*.
B. C. SPARROW, Washington, District of Columbia. 16483. '85. (XV)

PESITE, polishing stones (2), disk-shaped, natural formation, arrowhead, sinkers (2) (5 specimens); from Alabama.
FRANK BURNS, U. S. Geological Survey. 16484. '85. (III)

CARVED TEAK-WOOD TABLE,* with marble top; from China.
16485. '85. (I)

CLAY PIPES,* from Holland.
16486. '85. (II, A)

DRIED FUNGI* (over 100 specimens).
CARL SCHWALB, Hungary. 16487. '85. (XV)

AUTOMATIC STEAM-HEATER* for railway cars (model).
MICHAEL BLENNERHASSET HURLEY, Quebec, Canada. 16488. '85. (II, A)

CEREMONIAL OBJECTS, carved stone tablet, and weapon with incised figures, the so-called "Butterfly" (casts).
Dr. L. B. WELCH, Wilmington, Clinton County, Ohio. 16489. '85. (III)

CONFECTIONS.*
FLLI. FERRO E CASSANELLO, Genoa, Italy. 16490. '85. (I)

WOOL,* from Australia (2 fleeces).
16491. '85. (I)

WOOLEN GOODS,* from Australia.
16492. '85. (I)

ARTIFICIAL BUILDING STONES,* from Germany.
16493. '85. (XVII)

MICA,* large sheet, from Canada.
16494. '85. (XVI)

NAILS,* forged; wire, tacks and rivets.
ANONYMOUS SOCIETY OF BLACKSMITHS, Franche Comté, France. 16495. '85. (XVIII)

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* Received from New Orleans Exposition through State Department.

SCREW DRIVERS.*

G. MÄDER AND MÜLLER, Schmalkalden, Germany. 16496. '85. (II, A)

SESAME OIL,* *Sesamum orientale* (2 bottles), and peanut-oil; *Arachis hypogæa* (6 bottles).

D. GROSS & CO., Marseilles, France. 16497. '85. (I)

CEMENT,* from Italy.

16498. '85. (I)

ROYAL PAPRICO SPICE* from Buda Pest, made by Marpo & Wyden; and "Moorish national food."

16498. '85. (I)

MAMMAL SKINS,* from Australia.

16499. '85. (I)

SEEDS,* from the Experimental Gardens of Sweden.

16500. '85. (I)

TEXTILES.*

16501. '85. (I)

BIRD-SKINS, *Lophophanes dichrous, Certhia himalayana, Basileuterus flaveolus, Prinops graculinus, Sycobrotus kersteni, Musophaga violacea, Schizorhis zonurus, S. africana, Ortygarchus mangle, Aramides nigricans;* from various localities.

Dr. E. REY, Leipzig, Germany (purchased). 16502. '85. (V, A)

MAMMAL SKINS, *Putorius vison* (2 specimens).

M. BOWSKY, New York, New York. 16503. '85 (IV)

SWORD of sword-cane found at the bottom of the Delaware River near the mouth of the Brandywine, covered with about four inches of barnacles.

A. A. DULY, National Museum. 16504. '85. (I)

SWORD AND SCABBARD, captured at the battle of Tripoli by Commander Decatur and presented by him to the grandfather of the donor.

JOSEPH H. BROWN, U. S. National Museum. 16505. '85. (I)

MINERALS.

STATE OF NORTH CAROLINA. (Through Colonel P. M. Wilson, Raleigh, North Carolina.) 16506. '85. (XVI)

MARBLE.

W. S. YEATES, U. S. National Museum. 16507. '85. (XVII)

MINERALS.

Prof. JOSÉ BONILLA, Zacatecas, Mexico. 16508. '85. (XVI)

STEATITE,* kaolin, stibnite, wavellite, novaculite, fibrous gypsum and celestite. (13 specimens).

STATE OF ARKANSAS. (Through Dr. J. Guy Lewis.) 16509. '85. (XVI)

CORUNDUM AND KYANITE (3 specimens), from near Powder Springs, Cobb County, Georgia.

N. P. PRATT, Atlanta, Georgia. 16510. '85. (XIV)

CATLINITE, Thomsonite pebbles, and Thomsonite pebbles in trap.

STATE OF MINNESOTA. (Through Prof. N. H. Winchell.) 16511. '85. (XVI)

MAGNETITE, from Champion Mine, Marquette County, Michigan.

F. W. NOBLE, Detroit, Michigan. 16512. '85. (XIV)

PUBLICATIONS.† Four volumes of the Swiss National Museum, at Zurich.

GEORGE L. CATLIN, United States Consul, Zurich, Switzerland. 16513. '85. (V)

MINERALS, † from Japan.

THOMAS B. VAN BUREN, Consul-general, Kanagawa. 16514. '85. (XAI)

BOOK OF PHOTOGRAPHS, † from Palermo. 16515. '85. (II, A)

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* Received from the New Orleans Exposition.

† Received from the New Orleans Exposition through Department of State.

RUSH TABLE, from China. 16516. '85. (II, *a*)

TOOTH of recent horse, *Equus caballus*, superior molar; also samples of coal formation.
Dr. A. VAN CLEEF, Scranton, Pennsylvania. 16517. '85. (IV)

CAROLINA WREN, *Thryothorus ludovicianus*, from Branchville, Maryland.
Dr. T. H. BEAN, U. S. National Museum. 16518. '85. (V, A)

TERRESTRIAL GLOBE.* 16519. '85. (I)

MATERIA MEDICA;* *Ol. Eucalypti, Syr. Eucalypti rostratæ, Syr. Eucalypti globuli* (1 pint each); *Gummi Eucalypti rostratæ* (4 ounces); *Gummi Eucalypti obliquæ* (2 ounces); *Eucalyptine* (½ ounce); *Ol. Atherosperm. mosch.* (½ ounce); *Eucalyptus disinfectant* pastilles (6); Red gum lozenges (4 ounces); *Resina Pini calitritis* (2 ounces); and box of pure carbonate of magnesia. 16519. '85. (I)

JEW FISH,† *Promicrops itaiara;* from Newport, Rhode Island.
E. G. BLACKFORD, 80 Fulton Market, New York. 16520. '85. (VII)

SEEDS AND GUM,* from Sierra Leone, Africa. 16521. '85. (I)

TAPA CLOTH,* from Sandwich Islands. 16522. '85. (II, A)

RUDE HARP * used by the natives of Chamula, Chiapas, Mexico.
COMMISSION OF CHIAPAS, MEXICO. 16523. '85. (I)

RAMIE PRODUCTS,* illustrating the ramie industry.
C. ANDREE, agent. 16524. '85. (I)

RUSSIAN YOKE* for three-horse vehicle.
CHARLES G. HOFFMANN, agent for Russia. 16525. '85. (II, A)

SEEDS AND FIBERS *, from Teheran, Persia.
16526. '85. (I)

LIMONITE,* micaceous hematite, magnetite, galena, native copper, chalcopyrite, asphaltum, bornite, ulexite, quartz, pyrolusite, orthoclase, selenite, garnet, pyrrhotite and turquoise, from Persia.
16527. '85. (XVI)

ROCKS * (2 specimens) from Persia.
16527. '85. (XVII)

FOSSIL PLANTS * (2 specimens) from Persia.
16527. '85. (XIV)

PEAS AND BEANS * from Kingston, Jamaica.
16528. '85. (I)

CARBONATE OF MAGNESIA * (15 pounds).
THOMAS JENNINGS, Cork, Ireland. 16529. '85. (I)

CARPOLOGICAL SPECIMENS,‡ produced by W. R. Guilfoyle, F. R. S., Director of the Botanical Gardens, Victoria, Australia.
GOVERNMENT OF VICTORIA, Victoria, Australia. 16530. '85. (XV)

SEAL OILS * and fish guano, from Newfoundland.
16531. '85. (I)

SUGAR AND RUM.*
SAMUEL BARBER & Co., Georgetown, Demerara. 16532. '85. (I)

CHICORY ROOT,* kiln dried, and prepared chicory.
16533. '85. (I)

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* Received from the New Orleans Exposition through the Department of State.

† For further information concerning this accession see report on Department of Fishes, page 167.

‡ Received from the New Orleans Exposition.

COTTON FABRICS,* from Russia.
16534. '85. (I)

PALMETTO CORD,* from Africa.
16535. '85. (I)

SULPHUR,* cinnabar, etc. (22 specimens).
PIETRO MARANO, Catania. 16536. '85. (I)

CROCHET LACE,* Irish.
DUYER & CO., Cork, Ireland. 16537. '85. (I)

CANDIED FRUITS.* from Italy.
GIUSEPPE BRUNO, Palermo, Italy. 16538. '85. (I)

TARO FLOUR.*
ALDEN FRUIT AND TARO COMPANY, Wailuku, Hawaiian Islands. 16539. '85. (I)

CANDIED FRUITS,* from Italy.
GAV. SAL. RE GUILDI, Palermo, Italy. 16540. '85. (I)

CANNED GOODS,* from Germany.
J. H. PILLMAN, Braunschweig, Germany. 16541. '85. (I)

THERMOMETERS.*
16542. '85. (I)

RUBBER GOODS,* samples.
LEYLAND RUBBER COMPANY, Preston, Lancashire, England. 16543. '85. (I)

SKINES* (48), from Scotland.
J. AND W. STUART, Musselburgh, Scotland. 16544. '85. (I)

CARVED GOURDS* (5), from the Sandwich Islands.
16545. '85. (II, A)

FIBERS.*
E. CORÉT, Bologne, France. 16546. '85. (II, A)

WOOLEN AND COTTON GOODS,* from Austria-Hungary.
16547. '85. (I)

CHINESE "GOD OF WAR"* and palankeen, lacquered and silvered.
16548. '85. (I)

JAVA TEA,* rice, indigo, cinchona bark, gum da mar, copal, india rubber, etc.
W. SCHOFFER & CO., Rotterdam, Netherlands. 16549. '85. (I)

HAND LOOM,* from Africa; and map, from Vienna.
16550. '85. (II, A)

LIQUORS AND MARASCHINO ESSENCE.*
16550. '85. (I)

CRYSTALLIZED POTASH.*
16550. '85. (XVIII)

MAGNESIUM SULPHATE with sodium chloride, from mineral water, from Palo Pinto County; for examination.
D. H. GIBSON, Mineral Wells, Texas. 16551. '85. (XVI)

BIRDS' NESTS (9 specimens).
CHARLES W. RICHMOND, Washington, District of Columbia. 16552. '85. (V, B)

SAGENETIC QUARTZ.
ROBERT CLAYWELL, Morganton, North Carolina. 16553. '85. (XVI)

INSECTS, Macro-lepidoptera, mostly *Noctuidæ*, from the Adirondack Mountains.
Dr. C. S. MCKNIGHT, Saranac Lake, New York. 16554. '85. (X)

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* Received from New Orleans Exposition through Department of State.

WOODS.*
Maj. A. J. STUDER, United States Consul, Singapore, India. 16555. '85. (XV)

WOODEN SHOES.*
Maj. A. J. STUDER, United States Consul, Singapore, India. 16555. '85. (II, A)

RED FOSSIL ORE, and brown ore; for examination.
Hon. J. T. MORGAN, Washington, District of Columbia. 16556. '85. (XVIII)

FOSSIL BONES: shoulder-blade, metacarpal, etc., of a horse; probably *Protohippus parvulus* Marsh, and other fragments.
S. F. FLEHARTY, Antelopeville, Nebraska. 16557. '85. (IV)

LARVA of *Eristalis tenax;* for examination.
Dr. O. R. EARLY, Columbus, Kentucky. 16558. '85. (X)

SPEAR POINT (New Zealand) and Scotch plowman's spoon.
Mrs. MABEL HORN, Redding, Shasta County, California. 16559. '85. (II, A)

FIBRES,* from Brazil.
16560. '85. (I)

VEGETABLE OILS and seeds.*
L. C. BOYE, United States Consular Agent, Bonaire, West Indies. 16561. '85. (I)

MINERALS.*
L. C. BOYE, Bonaire, West Indies. 16561. '85. (XVI)

SUGARS*, from Sandwich Islands.
16562. '85. (I)

COTTON AND WORSTED FABRICS,* from Scotland.
16563. '85. (I)

TWIST TOBACCO.*
16564. '85. (I)

LACQUERED BOX AND BOOK COVER,* from Teheran, Persia.
16565. '85. (II, A)

WOOLS,* from Australia.
16566. '85. (I)

HOPS AND GUMS,* from Australia.
16567. '85. (I)

LEATHER,* from Australia.
16568. '85. (I)

OLIVE OIL and orange water.*
SOCIÉTÉ ANONYME, Nice, France. 16569. '85. (I)

EMBROIDERIES,* from Switzerland.
E. P. BEAUCHAMP, United States Consul, Saint Gallo. 16570. '85. (I)

ANTIMONY.†
JAPANESE COMMISSION. 16571. '85. (XVIII)

PICTURES,* illustrating manners and customs of various nations.
16572. '85. (II, A)

FANCY BASKETS* and cigar cases.
TH. EICHMANN, Prussia. 16573. '85. (II, A)

PHOTOGRAPHS* of scenes in Newfoundland, Italy, and Honolulu.
16574. '85. (II, A)

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*Received from New Orleans Exposition through Department of State.
†Received from New Orleans Exposition.

HOE,* axe, and scythe, hand made, from Thuringen, Germany.
G. T. MOSHER, United States Consul, Sonneberg, Germany. 16575. '85. (II, A)

SWAINSON'S WARBLER, *Helinaia swainsoni* (exchange).
ARTHUR T. WAYNE, Charleston, South Carolina. 16576. '85. (V, A)

NEST AND EGGS of Swainson's Warbler, *Helinaia swainsoni.*
ARTHUR T. WAYNE, Charleston, South Carolina. 16576. '85. (V, B)

BRONZE GRACKLE, *Quiscalus æneus* and Red Crossbill, *Loxia americana.*
GEORGE MARSHALL, Laurel, Maryland. 16577. '85. (V, A)

GREAT HORNED OWL, *Bubo virginianus.*
ROBERT RIDGWAY, U. S. National Museum. 16578. '85. (V, A)

MINERAL containing manganese, for examination.
Miss L. A. B. CORNACK, Genito, Powhatan County, Virginia. 16579. '85. (XVIII)

ASPHALTUM, for examination.
JAMES M. GRIGSBY, Montague, Texas. 16580. '85. (XVIII)

"PULLER," used for chopping pine trees; from North Carolina.
J. C. RUSSELL, Richmond, Virginia. 16581. '85. (I).

SOAP POWDER.
CHARLES DE SCHMIDT, Saint Paul, Minnesota. 16582. '85. (I)

FISH, *Selene gallus*, from North Carolina.
M. WILSON, Centre Market, Washington, District of Columbia. 16583. '85. (VII)

LEPIDOLITE, pink tourmaline, green tourmaline, spodumene, and cleavelandite (37 specimens) (exchange).
E. M. BAILEY, Andover, Maine. 16584. '85. (XVI)

SILK WORMS and cocoons, *Samia cynthia.*
C. M. FOUCHÉ, Knoxville, Tennessee. 16585. '85. (X)

LAND TORTOISE,* *Cistudo carolina*, from Symmes, Ohio.
JOHN S. POLLOCK, Smithsonian Institution. 16586. '85. (VI)

RUBBER BALLS.*
MÜNDEN AND HILDESHEIM, Münden, Germany. 16587. '85. (II, A)

TAPA CLOTH,* from Polynesia.
16588. '85. (II, A)

BASKETS,* from Polynesia.
16588. '85. (II, A)

ROCK DRILL, similar to those used in driving the Washington Aqueduct tunnel.
Capt. THOMAS W. SYMONS, U. S. Army, Washington. 16589. '85, (XVIII)

WOODEN SANDALS,* from Tripoli (1 pair).
16590. '85. (II, A)

BASKETS,* from Tripoli.
16590. '85. (II, A)

WOOL AND LEATHER SANDALS,* from Germany (3 pairs).
16591. '85. (II, A)

BOOTS AND SHOES* worn by lumbermen in Canada (4 pairs).
16592. '85. (II, A)

COTTON FABRICS,* from Canada.
16592. '85. (I)

NEGATIVES of microscopic sections of iron and steel (copied and returned).
F. L. GARRISON, Radnor, Pennsylvania, 16593. '85. (XVIII)

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*Received from New Orleans Exposition through Department of State.

INSECTS, showing variations of species of *Agrotis* (19 specimens.)
W. W. HILL, Albany, New York. 16594. '85. (X)

ORES.
F. P. BOYD, Fisher, Pennsylvania. 16595. '85. (XVIII)

POTTERY, from Panama (?).
Dr. J. F. BRANSFORD, U. S. N. 16596. '85. (II, B)

BIRD SKINS. *Parus turneri*, *Acanthis exilipes*, *Plectrophanes nivalis*, *P. hyperboreus* (recently discovered), *Zonotrichia coronata*, *Passerella townsendii*, *Perisoreus fumifrons*, *Nyctale richardsoni*, *Surnia caparoch*, *Lagopus rupestris*, *L. albus*, *Tringa maculata*, *T. ptilocnemis*, *T. couesi*, *Anas acuta*, *Somateria spectabilis* *Oceanodroma furcata*, *Simorhynchus cristatellus*, and *Uria californica* (71 specimens, 19 species), from Alaska.
J. W. JOHNSON, Ounalaska, Alaska, 16597. '85. (V, A)

ELK SKIN and antlers in the velvet.
E. W. NELSON, Springerville, Arizona. 16598. '85. (I)

ANTIQUITIES,* from headwaters of the San Francisco, New Mexico.
E. W. NELSON, Springerville, Arizona. 16598. '85. (II, A)

POTTERY, from headwaters of the San Francisco, New Mexico.
E. W. NELSON, Springerville, Arizona. 16598. '85. (II, A)

GRASS-CLOTH BLANKET† (African), from Morocco.
16599. '85. (II, A)

CHINA-WARE.†
MOORE & CO., Langton, Staffordshire, England. 16600. '85. (I)

MAJOLICA-WARE.†
HUGO LONITZ, Neuhaldensleben, Prussian Saxony. 16601. '85. (I)

VASES.†
CLEMENT MASSIER, Golfe Juan, Alpes Maritimes, France. 16602. '85. (X)

CHINA-WARE.†
WALLIS, GIMSON & CO., England, 16603. '85. (I)

CHINA-WARE.†
ERDMAN SCHLEGELMICH, Suhl, Prussian Saxony. 16604. '85. (I)

CHINA AND EARTHEN WARE.†
WEDGWOOD & CO., Tunstall, Staffordshire, England. 16605. '85. (I)

TERRA-COTTA VASES, glazed bricks, etc.†
BALFOUR AND CO., Longton, Staffordshire, England. 16606. '85. (X)

PORCELAIN-WARE, dinner-plates, cups, saucers, etc. (67 pieces).†
T. C. BROWN, WESTHEAD, MOORE & CO., Stoke-upon-Trent, England. 16607. '85. (I)

STONEWARE, basins, etc., from Russian Poland.
KASIMIR CHIVULSKI Cmielon, Russian Poland. 16608. '85. (I)

MARINE SHELLS (4 species), from Boca Ciega Bay, Florida.
U. S. GEOLOGICAL SURVEY, Washington, D. C. 16609. '85. (I, X)

RED COTTON,† and cloth made of same, from Malta.
16610. '85. (I)

AUSTRALIAN WOODS,† in book form.
16611. '85. (XV)

PLANKS,† from Australia.
16611. '85. (I)

BRAZILIAN WOODS.†
16612. '85. (XV)

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*For further information see report on Department of Archæology, page 108.
†Received from New Orleans Exposition through Department of State.

PORTLAND CEMENT,* materials exhibiting its composition.
TOEPFFER, GRAWITZ & Co., Stettin, Germany. 16613. '85. (XVIII)

CANNED MEATS, vegetables, etc.*
L. GRADER & HARTWIG, Gotha, Albertsbod. 16614. '85. (I)

IRISH BUTTER.*
T. J. CLANCHYS, Munster Dairies Depot, Cork, Ireland. 16615. '85. (I)

LEAF-TOBACCO,* from Java and Sumatra.
W. SCHOFFER & Co., Rotterdam. 16616. '85. (I)

PETROLEUM,* from Russia.
16617. '85. (XVIII)

COTTON FABRICS,* from Russia.
16617. '85. (II)

BOOTS AND SHOES,* from Russia.
16617. '85. (II, A)

PORCUPINE, *Cercolubes prehensilis* in the flesh.
ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania (through Arthur Edwin Brown, Esq.).
16618. '85. (IV)

BIRD, *Eulabes intermedia*, from Siam.
MISS ELEANOR REYNOLDS, Chestnut Hill, Philadelphia, Pennsylvania. 16619. '85. (V, A)

BRICK from the wall of China.
MISS REYNOLDS KRUG, Washington, District of Columbia. 16620. '85. (I)

PALE BAT, *Anthrozous pallidus* and young mouse, *Hesperomys* sp.
E. WILKINSON, Mansfield, Ohio. 16621. '85. (IV)

FISHES, from Mexico.
E. WILKINSON, Mansfield, Ohio. 16621. '85. (VII)

REPTILES (471 species), from Mexico.
E. WILKINSON, Mansfield, Ohio. 16621. '85. (VI)

ORE containing particles of metallic copper, for examination.
REV. W. H. DE ROSEAR, Primrose, Lee County, Iowa. 16622. '85. (XVIII)

BOX TORTOISE, *Cistudo carolina*, from Symmes, Ohio.
JOHN S. POLLOCK, Smithsonian Institution. 16623. '85. (VI)

VEGETABLE CHARCOAL, for examination.
F. H. WILLIAMS, Bristol, Connecticut. 16624. '85. (III)

"INDIAN PIPE," or "corpse plant," *Monotropa uniflora* L., for examination.
J. A. TAYLOR, Stanberry, Missouri. 16625. '85. (XV)

SPIDER, *Epeira riparia*, for examination.
M. E. SAWYER, Dickson, Tennessee. 16626. '85. (X)

HARLAN'S HAWK, *Buteo harlani*. A very valuable accession.
BURDETTE HASSETT, Howard Centre, Iowa. 16627. '85 (V, A)

SALMON, *Salmo salar*, juv (9 species).
A. G. CHENEY, Glens Falls, New York. 16628. '85. (VII)

SILICATE OF ALUMINA, probably kaolin, for examination.
H. WHITE, San Bernardino County, California. 16629. '85. (XVI)

MARINE SHELLS, from Florida (108 species).
CHARLES T. SIMPSON, Braiden Town, Florida. 16630. '85. (IX)

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* Received from New Orleans Exposition through Department of State.

PHOTOGRAPHS (53) of scenes in Jamaica (exchange).
S. C. BROWN, U. S. National Museum. 16631. '85. (II, A)

SNAKE, *Diadophis punctatus*, from Arlington, Virginia.
WILLIAM PALMER, U. S. National Museum. 16632. '85. (VI)

DOGS (9 skeletons).
SAMUEL EINSTEIN, pound master, Washington, District of Columbia. 16633. '85. (XII)

OIL LAMP,* made of brass, from Tetuan, North Africa. 16634. '85. (II, A)

BETEL-CHEWERS' OUTFIT,* leaf, lime, betel nut, tobacco, and cutter, from South Asia. 16635. '85. (II, A)

GUIMBRE,* a musical instrument, from Tangier, Morocco. 16636. '85. (II, A)

VEIL,* fillet, slippers (1 pair), and child's shoes (2 pairs). 16637. '85. (II, A)

SCREEN,* mandarin's silk robes (2), and pair of ladies' shoes.
16638. '85. (II, A)

CUP,* can, and tube, lacquered, from Corea.
16639. '85. (II, A)

BETEL-NUT CHEWER'S OUTFIT.*
A. G. STUDER, U. S. Consul, Singapore, India. 16640. '85. (II, A

HARNESS,* reins, halters, cords, etc.
A. and J. BIEZENAAR, Gouda, Holland. 16641. '85. (II, A)

WOODEN SHOES,* carved (3 pairs).
16642. '85. (II, A)

PHOTOGRAVURES of Extinct Reptiles,* .*Hylæobatrachus croyii*, *Bermissartiu Fagesii*, *Goniophalis simus*, *Iguanodon mantelli*, *I. bernissartensis*, and *Chitracephalus dumonii*, from Belgium.
16642. '85. (VIII.)

CLOTH SLIPPERS* (10 pairs), from Germany.
16643. '85. (II, A)

STATUETTES* of Cows (5), from Wirtemberg.
GEORGE L. CATLIN, U. S. consul, Stuttgart. 16644. '85. (II, A)

SHEPHERD CHECK SHAWL, from Scotland.
16646. '85. (II, A)

CHOPPING BOARDS* (3) and piggin.
16647. '85. (II, A)

MOORISH GILLABA,* from Morocco, Africa.
16648. '85. (II, A)

VELVET PURSE* and cigar case, from Fez.
16649. '85. (II, A)

PALMETTO BASKET* and wallets, from Africa.
16650. '85. (II, A)

SWORD,* scabbard, brush, water bottle, etc., illustrating leather-work.
16651. '85. (II, A)

BRASS TRAYS,* from Africa.
ABRAHAM COROS, U. S. Consular Agent, Mogador, Africa. 16652. '85. (II, A)

SEED NECKLACE * and wallet, from New Zealand. 16653. '85. (II, A)

WHIP * or brush, from Samoa. 16654. '85, (II, A)

VEGETABLE SILK.*
HENRY PEALE, U. S. Consul, Santiago, Cape Verde Islands. 16654. '85. (I)

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* Received from New Orleans Exposition through Department of State.

PHOTOGRAPHS of plaster-casts of a funeral column at Uxmal, Yucatan.
Dr. LE PLONGEON, Uxmal, Yucatan. 16655. '85. (II, A)

BASKETRY.*
MEXICAN COMMISSIONER, Oaxaca, Mexico. 16656. '85. (II, A)

STRAW PLACQUE,* from Estatua de Colon.
MEXICAN COMMISSIONER, Oaxaca, Mexico. 16657. '85. (II, A)

JICARAS* and stands, from Central America. 16658. '85. (II, A)
BARK CANOE,* from Chippewa Indians, Canada. 16659. '85. (II, A)

SEED CELLS of *Cucumis asinus*,* used as sponges and strainers. Also a bonnet made of the same material, from British Guiana.
WILLIAM FRESSON. 16660. '85. (II, A)

SEED MAT AND BASKET.*
C. E. JACKSON, U. S. Consul, Antigua, West Indies. 16661. '85. (II, A)

TURQUOISE (108 species), in gangue, New Mexico.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 16662. '85. (XVI)

FERRUGINOUS SANDSTONE, for examination.
O. A. BLACKMAN, Leavenworth, Crawford County, Indiana. 16663. '85. (XVII)

BIRD-SKINS;† 95 specimens mounted (mostly in excellent style), 59 species; collected in the States of Puebla and Vera Cruz, Mexico; forming part of the Mexican Government exhibit at New Orleans. A very valuable acquisition to the collection, especially on account of the excellence of the mounting. Several species are thus for the first time added to the exhibition series, while many old and poorly-mounted specimens have been replaced by those of the present collection.

The MEXICAN GEOGRAPHICAL and EXPLORING COMMISSION, through Prof. F. Ferrari Perez. 16664. '85. (V, A)

INSECT, probably *Lucilia* or a Sarcophagid.
LAVINIA C. DUNDORE, Washington, District of Columbia. 16665. '85. (XI)

MACARONI and vermicelli-glutinie.
LOUIS TRERES & CO., Turenne, France. 16666. '85. (I)

RIVOLI HUMMING BIRD, *Eugenes fulgens* (7 specimens).
F. FERRARI PEREZ, Puebla, Mexico. 16667. '85. (V, A)

BIRDS (91 specimens, 69 species), from Bardstown, Kentucky.
C. W. BECKHAM, Smithsonian Institution. 16668. '85. (V, A)

PHOTOGRAPHS of limestone quarries in Warren County.
Prof. J. R. PROCTOR, Lexington, Kentucky. (Through George P. Merrill.) 16669. '85. (XVII)

REEVES PHEASANT, *Phasianus reevesi*, ♂ in the flesh. Prior to this accession the Museum collection had but one of these birds, a female.
ZOÖLOGICAL GARDENS of Philadelphia. (Through Arthur E. Brown, Esq.) 16670. '85. (V, A)

CHLORITE, asbestus, and kyanite in quartz.
GEORGE W. LENDEREG, Roxbury, Connecticut. 16671. '85. (XVI)

SCANDIA PHOSPHOR-TIN.
LEWANDER & CO., Boston, Massachusetts. 16672. '85. (XVIII)

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* Received from New Orleans Exposition through Department of State.

† For complete list of the natural history collections made by the Commission, see "Proceedings United States National Museum," vol. 9, 1886, pp. 125–199.

SPEAR-HEADS (11), and a leaf-shaped implement, from Randolph County, Indiana.
ALEX. C. BLACK, Surgeon-General's Office, Washington, District of Columbia. 16673. '85. (III)

INSECTS, *Mallodon* (1 specimen), *Proculus* (6 specimens), *Passalus* (1 specimen), *Arcocinus longimanus* (5 specimens), from Guatemala.
MILES ROCK, 1430 College Hill Terrace, Washington, District of Columbia. 16674. '85. (X)

HOGNOSE SNAKE, *Heterodon platyrhinus*.
CHARLES A. BRUFF, Washington, District of Columbia. 16675. '85. (VI)

DECOMPOSED MATERIAL.
RICHARD SLANEY, Payson, Arizona. 16676. '85. (XVIII)

EARTHENWARE VASES and ornamental pitchers.*
THOMAS FORESTER & SONS, Longton, Staffordshire, England. 16677. '85. (I)

HORSE-TEETH and skeleton snake, from Todd's Limekiln Quarry, near Cartersville, Barton County, Georgia. (Returned.)
JOHN P. ROGAN. (Through U. S. Geological Survey.) 16678. '85. (XII)

INSECT, *Polyphylla 10-lineata*, Say.
N. H. BROWN, Lander, Wyoming. 16679. '85. (X)

BIRDS' EGGS, *Scops asio trichopsis*, from Fort Lowell, Arizona.
Capt. CHARLES E. BENDIRE, Fort Custer, Arizona. 16680. '85. (V, B)

ARCTIC TOWHEE, *Pipilo arcticus* (skin).
Capt. CHARLES E. BENDIRE, Fort Custer, Arizona. 16681. '85. (V, A)

BIRDS†: *Pyroderus orenocensis*, from Venezuela, and *Pharomacrus moccino*, from Guatemala.
COMMISSIONER OF VENEZUELA. 16682. '85. (V, A)

HYDROIDS, corallines and barnacles, from Cape Flattery, W. I.
JAMES G. SWAN, Port Townsend, Washington Territory. 16683. '85. (XI)

SCALLOPS and other shells, *Pecten caurinus*, and *Olivella biplicata* Say, from Cape Flattery.
JAMES G. SWAN, Port Townsend, Washington Territory. 16683. '85. (IX)

SILICIFIED CORAL, probably *Micheliva* sp.
D. S. DEERING, Independence, Iowa. 16684. '85. (XIII, A)

GRASSES, *Erianthus alopecuroides—E. saccharoides*, Michx, *E. brevibarbis*, Michx. and *Scirpus eriophorum*, Michx.
R. S. OWEN, Tuscaloosa, Alabama. 16685. '85. (XV)

DRIED HYDROID.
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16686. '85. (XI)

SKULL of an eel-pout, probably an undescribed species of *Zoarces*.
SAMUEL WILMOT, Newcastle, Ontario, Canada. 16687. '85. (VII)

PLANTS.‡ A large and valuable collection, including about 1,500 species, from the West and Southwest.
V. HAVARD, assistant-surgeon, U. S. Army, Fort Wadsworth, New York. 16688. '85. (XV)

MARINE INVERTEBRATES, from the eastern coast of North America.
U. S. FISH COMMISSION, Washington, District of Columbia. 16689. '85. (XI)

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* Received from New Orleans Exposition.

† Received from New Orleans Exposition through Department of State.

‡ This collection is treated of by the donor in a paper published in "Proceedings U. S. National Museum," VIII, Sept. 23, 1885, pp. 449–533.

MOLLUSKS, from the eastern coast of North America.
U. S. FISH COMMISSION, Washington, District of Columbia. 16689.

BATRACHIAN, *Rana catesbiana.*
U. S. FISH COMMISSION, Washington, District of Columbia. 16689. '85. (XI)

BIRDS, *Ampelis cedrorum, Sterna paradisea S. hirundo* (?), *Oceanodroma leucorhoa*, and *Oceanites oceanicus.*
U. S. FISH COMMISSION. 16689. '85. (V, A)

MAMMALS, *Putorius vison Condylura cristata, Erethrizon dorsatus*, and *Arctomys monax*, from Wood's Holl.
U. S. FISH COMMISSION, Washington, District of Columbia. 16689. '85. (IV)

INSECTS, *Blatta surinamensis, Camponotus pennsylvanicus, Pelecinus polycerator*, etc.
U. S. FISH COMMISSION, Washington, District of Columbia. 16689. '85. (X)

COKE.
J. H. BRUMWELL, Roanoke, Virginia. 16690. '85. (XVIII)

ANTIQUITIES. A collection of 75 specimens, including a flake, 11 arrow-heads, 2 hammer-stones, 3 grooved axes, 2 mauls, 7 rubbing-stones, metate, pestle, mortar, 2 arrow-shaft straighteners, fragment of a stone implement of unusual shape, polishing stone, small paint muller (?), cylindrical stone, stone tube (pipe ?), 2 shell ornaments, 7 quartz crystals, piece of unworked turquois, clay vessel, 4 fragments of pottery, and 22 fragments of stone implements and natural formations, from Fort Thomas, Ariz. Purchased.
J. H. CARLTON, Fort Thomas, Arizona. 16691. '85. (III)

HELMET, made of silver, ornamented with bosses of steel, with a leather cape attached, lined with embroidered silk.
D. W. ZANTZINGER, Washington, District of Columbia. 16692. '85. (II, A)

JAPANESE BREAD, presented to D. W. Zantzinger in 1858 by the Japanese Legation.
D. W. ZANTZINGER, Washington, District of Columbia. 16692. '85. (I)

MINERAL, for examination.
A. L. YECKLEY, Doans, Wilbarger County, Texas. 16693. '85. (XVI)

MADRAS CATAMARAN, for one man, one paddle (model). Obtained by Rev. C. H. S. Dall.
WILLIAM H. DALL, U. S. Geological Survey. 16694. '85. (II, A)

ROCKS. (Exchange.)
PROF. W. O. CROSBY, Boston, Massachusetts. 16695. '85. (XVII)

ROCKS, from Massachusetts.
GEORGE P. MERRILL, U. S. National Museum. 16696. '85. (XVII)

STALAGMITIC MARBLE, from the Luray Cave, Virginia.
HENRY HORAN, U. S. National Museum. 16697. '85. (XVII)

EARTH, for analysis.
W. F. CHAPLIN, Orangeburgh, South Carolina. 16698. '85.

ALBITE.
CHARLES MILLER, Jr., Sanborn, New York. 16699. '85. (XXI)

ESKIMO KYAK. Purchased while donor was with the Greely Relief Expedition.
C. S. MCLAIN, U. S. Navy. 16700. '85. (II, A)

LUMP-FISH, *Cyclopterus lumpus.*
F. C. JESSUP, keeper Petunk L. S. Station, West Hampton, New York. 16701. '85. (VII)

FULGURITE and sand.
A. N. ABBOTT, Union Grove, Illinois. 16702. '85. (XVII)

SANDERLING, *Calidris arenaria*, shot at Gravely Run, Virginia.
JOHN DOWELL, Washington, District of Columbia. 16703. '85. (V, A)

ELECTRIC EEL, *Gymnotus electricus.*
E. G. BLACKFORD, 80 Fulton Market, New York. 16704. '85. (VII)

PYGMY SPERM WHALE, *Kogia breviceps*, ♂, juv.
C. T. GRIMM, Loveladies Island, New Jersey. 16705. '85. (IV)

PYGMY SPERM WHALE, *Kogia breviceps*, ♀ ad.
JOEL RIDGWAY, Barnegat City, New Jersey. 16706. '85. (IV)

OWL, *Glaucidium gnoma*, from San Francisco, California.
H. W. TURNER, U. S. Geological Survey. 16707. '85. (V, A)

"SKATE," caught at Fortress Monroe.
JAMES GODDEN, Washington, District of Columbia. 16708. '85. (VII)

KING-FISH, *Menticirrus nebulosus.*
I. P. MILLER, Portsmouth, New Hampshire. 16709. '85. (VII)

ORES, from Montana and Oregon. (Exchange.)
F. J. PARKER, Washington, District of Columbia. 16710. '85. (XVIII)

MORTAR, from an old tower at Newport.
NEWPORT NATURAL HISTORY SOCIETY, Newport, Rhode Island. 16711. '85. (I)

PORPOISE, *Prodelphinus doris*, from southern Atlantic coast.
U. S. FISH COMMISSION, Washington, District of Columbia. 16712. '85. (IV)

MOLLUSKS, from southern Atlantic coast.
U. S. FISH COMMISSION, Washington, District of Columbia. 16712. '85. (IX)

FISHES, from southern Atlantic coast.
U. S. FISH COMMISSION, Washington, District of Columbia. 16712. '85. (VII)

MARINE INVERTEBRATES, from Atlantic coast of Southern States.
U. S. FISH COMMISSION, Washington, District of Columbia. 16712. '85.

PLUM LEAVES covered on one side with insects, probably *Aphis pruni.*
Mrs. M. E. CROMLEY, Dolores, Colorado. 16713. '85. (X)

MONKEYS, brought from Paris.
Mrs. ALEXANDER GRAHAM BELL, Washington, District of Columbia. 16714. '85. (IV)

SWORDFISH IRON.
WILLARD NYE, New Bedford, Massachusetts. 16715. '85. (I)

OYSTERS, from Wood's Holl, Massachusetts.
U. S. FISH COMMISSION, Washington, District of Columbia. 16716. '85. (J. R. R.)

FLEMISH TAPESTRY, described in Part I, p. 65.
Lieut. Gen. P. H. SHERIDAN, U. S. Army. 16717. '85. (I)

GAIRDNER'S TROUT, *Salmo irideus gairdneri* (diseased).
L. W. GREEN, Baird, Shasta County, California. 16718. '85. (XXI)

WHITEFISH, *Coregonus williamsoni*, Gd., from White River, near Meeker, Garfield County, Colorado.
JAMES L. FOLEY, Covington, Kentucky. 16719. '85. (VII)

* WORKING MODELS of steam-ships, composite steam-yacht, cotton steam-ship, pleasure boats, etc. (10).
W. POWER, Kingston, Canada. 16720. '85. (II, A)

MODEL showing improvement in the construction of iron vessels. Patented and made by donor.
D. W. ZANTZINGER, Washington, District of Columbia. 16721. '85. (II, A)

* CORNET, violin case, and strings.
M. P. TOMSCHIK & SOHN, Brunn, Austria. 16722. '85. (I)

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* Received from New Orleans Exposition.

CRAYFISHES.
H. G. HODGE, York, Illinois. 16723. '85. (XI)

SEEDS.
R. VALENTINE, Janesville, Wisconsin. 16724. '85. (XV)

KANGAROO, *Macropus rufus*.
BARNUM, BAILEY & HUTCHINSON, Bridgeport, Connecticut. 16725. '85. (XIV)

OLD SHOE, found in a settlement of foreigners at Petoskey, Michigan.
R. EDWARD EARLL, U. S. National Museum. 16726. '85. (II, A)

BIRDS, *Sialia sialis*, *Sitta pusilla*, *Cistothorus palustris*, *Dendroica pinus* (?), *Geothypis trichas*, *Icterus galbula*, *Myiarchus crinitus*, from Piney Point, Maryland.
L. M. TURNER, Smithsonian Institution. 16727. '85. (V, A)

BROOK TROUT,* *Salvelinus fontinalis*, ♂, from Lake Sunapee, New Hampshire.
E. B. HODGE, Plymouth, New Hampshire. 16728. '85. (VII)

STONE IMPLEMENTS,† from Carroll and Howard Counties, Indiana.
B. W. EVERMANN, Bloomington, Indiana. 16729. '85. (III)

BIRD SKINS. 105 specimens from Faroe Isles, Orkney, Archangel, France, England, and Turkey.
EDWARD HARGITT, Bedford Park, Chiswick, England. 16730. '85. (V, A)

PLANT, probably *Astragalus bigelowi*, Gray, from Fort Elliott, Texas.
Dr. W. T. PARKER, Newport, Rhode Island. 16731. '85. (XV)

FATTY TUMOR taken from the abdomen of a trout, for examination.
R. CONNABLE & SON, Petoskey, Michigan. 16732. '85. (A. N. M.

DOLL, dressed as an Ottawa chief's wife.
Mrs. H. S. BAIRD, Green Bay, Wisconsin. 16733. '85. (II)

FRUIT,‡ sixteen cans, from Singapore. 16734. '85. (I)

LIMONITE, dolomite and calcite, and melanterite and pyrite (3 specimens), from Blount County, Alabama.
FRANK BURNS, U. S. Geological Survey. 16735. '85. (XVII)

ARGILLITE IMPLEMENTS (10), found in a gravel-bed at Trenton, New Jersey, by Dr. C. C. Abbott.
Dr. CHARLES RAU, U. S. National Museum. 16736. '85. (III)

PENOBSCOT SALMON, *Salmo salar*, raised from the egg at Wytheville, Virginia.
U. S. FISH COMMISSION. 16737. '85. (VII)

INSECTS. The collection of Dr. C. V. Riley, Honorary Curator of Insects, U. S. National Museum. Described on page 181 of this report.
Dr. C. V. RILEY, Department of Agriculture. 16738. '85. (X)

LEAF-SHAPED IMPLEMENT of brown jasper, and an arrowhead, from the Chenate Mountains, Presidio County, Texas.
THOMAS W. STEWART, Presidio, Presidio County, Texas. 16739. '85. (III)

CRAY-FISHES. Collection including three species new to the Museum collection, *Astacus pallipes* Lieb; *Cambarus cubensis* Erichs; *C. putnami* Fox.
MUSEUM OF COMPARATIVE ZOOLOGY, Cambridge, Massachusetts (through Prof. Walter Faxon). 16740. '85. (XI)

REPTILES, *Bothrops xanthogrammus* (2 specimens) and *Spilotis pœcilonatus* (11 specimens).
E. T. GODDARD, Bahia de Caraquez, Ecuador. 16741. '85. (VI)

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* For further information concerning this accession see report on Department of Fishes, page 168.

† For further information concerning this accession see report on Department of Antiquities, pages 104–105.

‡ Received from New Orleans Exposition through Department of State.

LEOPARD, *Felis leopardus*, in the flesh.
BARNUM, BAILEY & HUTCHINSON, Bridgeport, Connecticut. 16742. '85. (IV)

ALLIGATOR FISHES, *Podothecus acipenserinus*.
Lieut. H. E. NICHOLS, Sitka, Alaska. 16743. '85. (VII)

EGGS of American Coot, *Fulica americana* (2).
A. N. FULLER, Lawrence, Kansas. 16744. '85. (V, B)

DUCK, *Oidemia perspicillata* (head and foot); for examination.
JUNIUS P. LEACH, Rushville, Illinois. 16745. '85. (V, A)

BURGESS'S "CHALLENGE" FISH FOOD.
WILLIAM BURGESS, Berry Lodge, Malvern Wells, England. 16746. '85. (I)

SOLE, *Solea vulgaris* (2 specimens), from England.
E. G. BLACKFORD, New York, New York. 16747. '85. (VII)

AFRICAN FIGURES. Two manikins, prepared in Paris under direction of director of the Trocadéro Museum. (Purchased, 720 fr.)
JULES HEBERT, 9, rue Henri Martin, Paris, France. 16748. '85. (II, A)

CAMBRIAN FOSSILS, from the St. John group (53 specimens).
G. F. MATTHEW, St. John, New Brunswick. 16749. '85. (XIII, A)

PARASITIC COPEPODS from a cramp-fish, *Torpedo occidentalis*, from Provincetown, Massachusetts.
J. HENRY BLAKE, Cambridge, Massachusetts. 16750. '85. (XI)

MOLLUSKS, *Partula* (*Diplomorpha*) *Layardü* Brazier (2 specimens), from Salisboe Island, South Pacific.
Dr. D. W. HARTMAN, West Chester, Pennsylvania. 16751. '85. (IX)

SNAKES, *Tropidonotus sipedon* and *Heterodon platyrhinus*, from North Carolina.
Dr. H. C. YARROW, U. S. National Museum. 16752. '85. (VI)

BIRDS (8 species), including a dodo pigeon, *Didunculus strigirostris* (11 species), from Samoa.
Dr. T. CANISIUS, Chicago, Illinois. 16753. '85. (V, A)

"KAVA" OUTFIT, including a bowl (Tanoa taina), in which the drink is made; a cocoanut-shell cup (Oleipu tan Kava); fan used to clear the chewed root from the drink; and two pieces of the root of *Piper metisticum*, from which the beverage is prepared. Also a rug (Iasinga), from Samoa.
KING OF THE SAMOAN ISLANDS (through Department of State). 16754. '85 (I)

PHYLLOPOD CRUSTACEANS, *Branchipus vernalis*.
WILLIAM KAYSER, Wapakoneta, Ohio. 16755. '85. (XI)

BIRDS, for examination (13 specimens).
H. K. COALE, Chicago, Illinois. 16756. '85. (V, A)

FOSSILIFEROUS CHERT, for examination.
O. A. BLACKMAN, Leavenworth, Indiana. 16757. '85. (XVII)

FLINT-LOCK GUNS (8 pieces), from an extensive Indian grave-yard near Bainbridge, Lancaster County, Pennsylvania. The objects were found during the removal of the top-soil of a limestone quarry.
Dr. T. H. BEAN, U. S. National Museum. 16758. '85. (III)

BOWS AND ARROWS (2 sets), from the Arapahoe and Cheyenne Indians, Darlington, Idaho. (Purchased.)
Capt. J. M. LEE, Ninth Infantry, U. A. Army, acting Indian agent. 16759. '85. (III)

CRABS, parasites, crustacea, worms, and amphipods.
U. S. FISH COMMISSION (through Vinal N. Edwards, Woods Holl, Massachusetts). 16760. '85. (XI)

SQUIDS.
U. S. FISH COMMISSION (through V. N. Edwards, Wood's Holl, Massachusetts). 16760. '85. (IX)

BIRDSKINS, from Florida and Pennsylvania.
GEORGE W. ROBERTS, West Chester, Pennsylvania. 16761. '85. (V, A)

MAMMALS, *Sciurus hudsonius* and *Lepus palustris*, from Drayton Island, Fla.
GEORGE W. ROBERTS, West Chester, Pennsylvania. 16761. '85. (IV)

CRUDE NITRATE, from Iquique.
I. R. BARTLETT, commander and hydrographer, U. S. Navy. Hydrographic Office, Washington, District of Columbia. 16762. '85. (XVIII)

FOSSIL, *Columnaria alveolata*, from the Trenton group, Maury County, Tennessee.
FRANK BURNS, U. S. Geological Survey. 16763. '85. (XIII, A)

MINERALS. An addition to the collection now on exhibition (deposited).
JOSEPH WILLCOX, Media, Pennsylvania. 16764. '85. (XVI)

CHIRIQUI POTTERY, valued at $100 (exchange).
Dr. T. L. FLOOD, Meadville, Pennsylvania. 16765. '85. (II B)

PERIODICAL. File of "Illustrirte Zeitung" for the years 1873 and 1874.
Prof. OTIS T. MASON. 16766. '85. (II A)

MOLLUSKS, from Moline, Illinois, and Nashville, Tennessee.
R. ELLSWORTH CALL, Moline, Illinois. 16767. '85. (IX)

BILL FISH, *Fistularia tabaccaria*.
W. S. GREEN, keeper Long Branch Light-Ship Station, Monmouth County, New Jersey. 16768. '85. (VII)

FISH, *Merlucius bilinearis*.
Captain DOANE, Light-Ship 41, Vineyard Sound. 16769. '85. (VII)

INSECT, *Prionus cristatus* Linn.
WILLIAM REAR, Nashville, Tennessee. 16770. '85. (X)

ETHNOLOGICAL OBJECTS: War knife made from sword-bayonet blade; pipe, carved to represent "Killer-fish man" and "Havi," taken from graves of "Shuans" in Southeast Alaska.
Lieut. DIX BOLLES, U. S. Navy. 16771. '85. (II, A)

SNOWY OWL, *Nyctea nyctea*. (Purchased.)
JAMES DEANE, Alexandria, Virginia. 16772. '85. (V, A)

PICTURE of the schooner *James S. Lowell* (which sank the *Tallapoosa*).
T. K. REED, Booth Bay, Maine. 16773. '85. (I)

ORGANIC DEPOSIT, probably bat guano; contains nitrates, potash, phosphates, ammonia, etc.; for examination.
J. H. HORNUNG, Oasis, Utah. 16774. '85. (XVI)

"LONG HORN," *Cicanthocinus nodosus* Fab.
GEORGE H. OELRICHS, Washington, District of Columbia. 16775. '85. (X)

SEEDS of *Liatris odoratissima*. (Purchased.)
WALLACE BROS., Statesville, North Carolina. 16776. '85. (XV)

BLACK MACAQUE, *Cynopithecus niger*, juv.
W. A. CONKLIN, Central Park Menagerie. 16777. '85. (XII)

SHAD, *Clupea sapidissima*.
U. S. FISH COMMISSION, Washington, District of Columbia. 16778. '85. (VII)

FOSSILS.
WILLIAM B. HAMILTON, Collingwood, Ontario, Canada. 16779. '85. (XIII, V)

INSECTS, mostly Diptera (26 vials).
Dr. B. H. WARREN, West Chester, Pennsylvania. 16780. '85. (X)

JACK RABBIT.
E. BUMGARDNER, Holton, Kansas. 16781. '85. (IV)

FOSSIL, *Nucleocrinus verneuili*, Devonian, from Charleston, Indiana.
H. C. DUVALL, Washington, District of Columbia. 16782. '85. (XIII, A)

PIERCED TABLET, found in a corn-field in Berea Township, Cuyahoga County, Ohio
H. C. DUVALL, Washington, District of Columbia. 16782. '85. (III)

CAMBRIAN FOSSILS (134 specimens), from Sweden (exchange).
Dr. G. LINDSTROM, Stockholm, Sweden (through C. D. Walcott). 16783. '85. (XIII, A)

ARGENTITE, from Rabbit Mountain Mine, near Port Arthur, Ontario.
Mrs. EDWARD A. WILD, Brookline, Massachusetts. 16784. '85. (XVI)

MODEL OF CANOE.
JOSEPH PASSENO, Washington, District of Columbia. 16785. '85. (I)

PLOW AND YOKE,* from Managua, Nicaragua. 16786. '85. (II, A)

PLOW, * similar to those used over two thousand years ago in Sicily.
ALBERT WOODCOCK, U. S. consul, Catania, Sicily. 16787. '85. (II, A)

BOOK, copy of a work on the discovery of the circulation of blood, published in Rotterdam, in 1648, by Dr. William Harvey. (Deposited.)
G. BROWN GOODE, U. S. National Museum. 16788. '85. (II, A)

STONE IMPLEMENT, with grooves, from Vineyard Haven, Dukes County, Massachusetts.
THOMAS LEE, U. S. Fish Commission. 16789. '85. (III)

KYANITE, actinolite, moonstone, orthoclase, stilbite and aragonite (9 specimens).
Capt. JOHN J. WILLIAMS, Thurlow, Pennsylvania. 16790. '85. (XVI)

NEOTROPICAL BIRDS,* 3 species, from Venezuela (?) (8 specimens.) 16791. (VII)

BIRD-SKINS, from Venezuela (9 species, 13 specimens). (Purchased.)
H. K. COALE, Chicago, Illinois. 16792. '85. (V, A)

BIRD-SKINS, *Junco caniceps, J. annectens, J. dorsalis and J. oregonus.* (13 specimens.)
Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 16793. '85. (V, A)

VANILLA SEED, *Prilisa odoratissima.*
A. H. CURTISS, Talleyrand Place, Florida. 16794. '85. (XV)

COTTON,† roll, yarn, etc.
GOVERNMENT OF SIAM. 16795. '85. (I)

SALAMANDER, *Amblystoma punctatum.*
Mrs. F. L. LEE, Westport, Essex County, New York. 16796. '85. (VI)

SILVER ORE, from Raymond & Ely Mine, Pioche, Nevada.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 16797. '85. (XVIII)

IRON STIRRUPS (an ancient pair).
HARRY STUART, agent for Guatemala Central Railroad, Guatemala. 16798. '85. (III)

INVERTEBRATE FOSSIL, *Bellerophon* sp.
CHAUNCEY ROBINSON, Burlington, Iowa. 16799. '85. (XIII, A)

MOLLUSK, *Margaritana complanata* Barnes, from Neosho River, Kansas.
Dr. W. S. NEWLON, Oswego, Kansas. 16800. '85. (IX)

CARVED STONE PLATE, carried from Japan to Holland, by Dutch merchants, in the seventeenth or eighteenth century. (Deposited.)
G. BROWN GOODE, U. S. National Museum. 16801. '85. (XVI)

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* Received from New Orleans Exposition through Department of State.
† Received from New Orleans Exposition.

FOX SQUIRREL, *Sciurus niger cinereus*, from Maryland.
J. D. FARDEN, Washington, District of Columbia. 16802. '85. (IV)

SEAL-HUNTER'S GAFF, used by fisherman in killing young "Harp" seals on the ice.
A. D. BROWN, St. John's, Newfoundland. 16803. '85. (I)

BIRD-SKINS, *Stercorarius parasiticus*, *Hydrochelidon surinamensis*, from North Atlantic.
U. S. FISH COMMISSION, Washington, District of Columbia. 16804. '85. (V, A)

HORNET'S NEST, from Georgetown, District of Columbia.
FREDERICK WITZEL, West Washington, District of Columbia. 16805. '85. (X)

INSECT, *Tremex columba*, for examination.
Dr. C. P. BAIRD, Winchester, Tennessee. 16806. '85. (X)

LEAF-SHAPED IMPLEMENT, perforator, and arrow-heads (7), from southern Indiana.
J. T. ABERT, U. S. Engineer Corps. (Through C. D. Walcott.) 16807. '85. (III)

QUARTZITE, water-worn, from near Salt Lake, Utah; for examination.
W. R. BRADFORD, Roxbury, Massachusetts. 16808. '85. (XVI)

MODELS OF WAGONS,* six-mule Government wagon, two-horse farm wagon, farm-cart.
STUDEBAKER & BRO., South Bend, Indiana. 16809. '85. (II, A)

BIRD-SKINS. A collection comprising a very complete series of *Motacilla yarrelli*, and *Anthus pratensis*, 10 species (87 specimens).
R. BOWLDER SHARPE, British Museum, Kensington, London, England. 16810. '85. (V, A)

SOUTH AMERICAN BIRDS, *Myiarchus* sp. nov. and *Merula* sp. nov.; new to the collection.
H. K. COALE, Chicago, Illinois. 16811. '85. (V, A)

BIRDS' NESTS, from District of Columbia (5 specimens).
CHARLES W. RICHMOND, Washington, District of Columbia. 16812. '85. (V, B)

WESTERN WATER THRUSH, *Seiurus noveboracensis notabilis*, from Santa Cruz.
ALBERT M. INGERSOLL, Santa Cruz, California. 16813. '85. (V, A)

COPPER ORES.
JOHN LAWLOR, Prescott, Arizona. 16814. '85. (XVIII)

SHELL, *Neritina virginea* Laur.
R. A. LIVELY, Williamsport, Virginia. 16815. '85. (IX)

FISHES, *Chilomycterus geometricus*, *Tetrodon turgidus*, and *Alutera schœpfii*, from Colonial Beach, Potomac River.
MAURICE CROPLEY, Washington, District of Columbia. 16816. '85. (VII)

STAR-FISH, *Asterias Forbesii*, from Colonial Beach.
MAURICE CROPLEY, Washington, District of Columbia. 16816. '85. (XI)

ZUÑYITE (2 specimens), from Colorado.
W. F. HILLEBRAND, U. S. Geological Survey. 16817. '85. (XIV)

MATERIA MEDICA, collection.
FREDERICK STEARNS & CO., Detroit, Michigan. 16818. '85. (I)

REPTILES, *Amblystoma tigrinum* (4 specimens).
Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 16819. '85. (VI)

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* Received from New Orleans Exposition.

YELLOW BOA, *Chilobothrus inornatus*, from Jamaica.
ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania. 16820. '85. (VI)

ILLUSTRATIONS OF BOATS (12 sheets) published in the eighteenth century.
SANDERSON SMITH, New Brighton, Staten Island, New York. 16821. '85. (I)

ILLUSTRATIONS OF BIRDS (3 sheets.)
SANDERSON SMITH, New Brighton, Staten Island, New York. 16821. '85. (V, A)

ILLUSTRATIONS of marine invertebrates.
SANDERSON SMITH, New Brighton, Staten Island, New York. 16821. '85. (XI)

ILLUSTRATIONS of plants (4 sheets).
SANDERSON SMITH, New Brighton, Staten Island, New York. 16821. '85. (XV)

FRENCH CHEMICAL WEIGHTS, 50 grammes to 1 milligramme. (Deposited.)
ROMYN HITCHCOCK, U. S. National Museum. 16822. '85. (I)

GOLD ORE and Samarskite, from Mariposa County, Cal.
Dr. J. R. RODGERS, Washington, District of Columbia. 16823. '85. (XVIII).

SHELLS, *Phyllonotus radix* Lamarck. *Phyllonotus regius* Swainson, *Turbo marmoratus* Linné, *Haliotis tubifera* Lamarck, *Cypræa tigris* Linné, *Meleagrina margaritifera* Linné.
JOHN S. LAMSON & BRO., New York City. 16824. '85. (IX)

MANGANESE ORE, from Nova Scotia.
JOHN S. LAMSON & BRO., New York City. 16824. '85. (XVIII)

SALAMANDER, *Amblystoma tenebrosum*.
J. LEVISON, Portland, Oregon. 16825. '85. (VI)

HICKORY SHAD, *Clupea chrysochloris*, from Osage River, Camden County, Missouri.
I. G. W. STEEDMAN, Saint Louis, Missouri. 16826. '85. (VII)

REINDEER, *Rangifer tarandus* (skin and hoof), Parry's Spermophile, *Spermophilus empetra*. Also part of an elephant's tooth.
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (IV)

SHELL, *Buccinum glaciale* L.
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (IX)

COAL.
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (XVIII)

SPOON made of horn of mountain sheep, mask, 2 jade implements, jade ornament, piece of jade, fishing-hooks, carving and bone labrets.
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (II, A)

PYRITE and Siderite (1 specimen each).
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (XVI)

STAR FISHES, *Cribrella* (2 specimens) and Ascidian *Boltenia* (one specimen).
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (XI)

SANDSTONE, and Septarian nodule (2 specimens).
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (XVII)

INSECTS, *Mallophaga*, Dipterous larva, and *Arctia* larva.
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (X)

BIRDSKINS. Seventeen species (39 specimens).
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (V, A)

BIRDS' NESTS AND EGGS. Lapland Longspur. *Centrophanes lapponicus* (3 nests and 13 eggs), Ruffed Grouse, *Bonasa umbellus* (nest and 1 egg), Pectoral Sandpiper, *Actodromas maculata* (nest, 4 eggs).
HENRY D. WOOLFE, Cape Lisburne, Alaska. 16827. '85. (V, B.)

LLAMA, *Llama glama*, in the flesh.
BARNUM, BAILEY AND HUTCHINSON, Bridgeport, Connecticut. 16828. '85. (IV)

ZIRCON crystal in hornblende, from Renfrew County, Ontario. (Exchange.)
JOSEPH WILLCOX, Media, Pennsylvania. 16829. '85. (XVI)

PHOTOGRAPHS (3) of the James Lick Observatory.
H. E. MATTHEWS, James Lick Observatory, San Francisco, California. 16830. '85. (I)

IRON and steel, manufactured.
AMERICAN INSTITUTE OF MINING ENGINEERS, New York City. 16831. '85. (XVIII)

MONKEY, *Macacus pelops*, in the flesh.
W. A. CONKLIN, Central Park Menagerie, New York City. 16832. '85. (IV)

AMERICAN HERCULES BEETLE. *Dynastes tityus*.
W. H. TISON, Cuthbert, Georgia. 16833. '85. (X)

COLLIE BITCH "Clipsetta," *Canis familiaris*. Sire, prize dog "Eclipse;" dam, "Nesta."
JAMES WATSON, Philadelphia, Pennsylvania. 16834. '85. (IV)

TROUT, *Salvelinus* of the *oquassa* type, from New Haven, Connecticut.
E. B. HODGE, Plymouth, New Hampshire. 16835. '85. (VII)

CRAWFISH (2 specimens).
H. G. HODGE, York, Clark County, Illinois. 16836. '85. (XI)

FRUITS and woods from common trees in Illinois.
H. G. HODGE, York, Clark County, Illinois. 16836. '85. (XV)

CORYNITE and Siderite, from Olsa, Carinthia; and Brochantitel (specimen), from Clifton, Arizona. (Exchange.)
WILLIAM G. ROTHE, Brooklyn, New York. 16837. '85. (XVI)

BIRD-SKINS, for examination.
GEORGE N. LAWRENCE, New York City. 16838. '85. (V, A)

BIRD-SKINS, *Odontophorus leucolæmus*, *Conurus finschi*, *Euphonia elegantissima*, *Piranga testacea*, and *Centurus hoffmanni*, from Costa Rica. (Purchased).
FREDERICK STEARNS & Co., Detroit, Michigan. 16839. '85. (V, A)

SHREW, *Blarina exilipes* Baird.
F. A. SAMPSON, Sedalia, Missouri. 16840. '85. (IV)

SHELL, *Unio phaseolus*, from Neosho River, Kansas, for examination.
Dr. W. S. NEWLON, Oswego, Kansas. 16841. '85. (IX)

PHOTOGRAPH NEGATIVES (34) of stone quarries, quarrying machinery, etc., taken by the donor. Mounted.
GEORGE P. MERRILL, U. S. National Museum. 16842. '85. (XVII)

SEEDS of Nymphœ.
Prof. ROBERT CASPARY, Konigsberg, Germany. 16843. '85. (XV)

ALTERED ROCKS, for examination.
S. J. NELSON, Canton, Bradford Co., Pennsylvania. 16844. '85. (XV)

ORE and buttons (4) containing tin and lead.
J. H. MITCHELL, Philadelphia, Pennsylvania. 16845. '85. (XVIII)

GOOSE BARNACLE, *Lepas*, for examination.
A. F. MAHLMAN, Little River, California. 16846. '85. (XI)

BIRD-SKINS, from Costa Rica (2 specimens), for examination. (Returned.)
FREDERICK STEARNS & Co., Detroit, Michigan. 16847. '85. (V, A)

INDIAN HEAD-DRESS and a leather provision bag. (Purchased.)
THOMAS DONALDSON, Philadelphia, Pennsylvania. 16848. '85. (II, A)

STONE IMPLEMENT of coarse-grained syenite, and two spear heads, from Birmingham, Erie County, Ohio.
Mrs. D. L. NIELSON, Vermilion, Ohio. 16849. '85. (III)

BROWN IRON ORE, produced by alteration of pyrites.
I. G. TRUE, Salides, Colorado. 16850. '85. (XVI)

VARANUS, *v. bengalensis*, in the flesh.

ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania. (Through A. E. Brown.) 16851. '85. (VI)

BIRDS. Blue Jay, *Cyanocitta cristata* (2 specimens); Meadow Lark, *Sturnella magna*, and Downy Woodpecker, *Picus pubescens* (skeleton).

J. D. FARDEN, Washington, District of Columbia. 16852. '85. (XII)

SOIL from borings made by surveying expeditions under Captain Selfridge in the vicinity of the Atrato and Napipi Rivers, with field note-book and map showing points of borings.

J. R. BARTLETT, commander U. S. Navy, Hydrographic Office, U. S. Navy Department. 16853. '85. (XVII)

PAPER made from the Indian corn plant.

Prof. SANDERSON SMITH, New Brighton, Staten Island, New York. 16854. '85. (I)

SNOW GROUSE, *Chen hyperboreus nivalis*, from Currituck Sound, North Carolina.

DAVID KING, 1228 Connecticut avenue, Washington, District of Columbia. 16855. '85. (V, A)

CARBONATE OF COPPER.

WILLIAM F. DOTY, Durango, Colorado. 16856. '85. (XVI)

MARINE SHELLS, 21 species (exchange).

Prof. A. G. WETHERBY, Saint Andrews Bay, Florida. 16857. '85. (IX)

FISHES, *Platophrys nebularis* (2 species) and *Etropus crossotus* (or *nebularis*).

Prof. ALEXANDER AGASSIZ, Museum of Comparative Zoology, Cambridge, Massachusetts. 16858. '85. (VII)

MIOCENE FOSSILS, from the shore of Willapa River, Washington Territory.

C. W. WOLFF, Aurora, Oregon. 16859. '85. (XIII, B)

STONE MORTARS (2 species).

W. P. SUTTON, U. S. Consul-general, Matamoros, Mexico. 16860. '85. (II, A)

STONE PESTLE.*

MEXICAN COMMISSIONER. 16861. '85. (II, A)

MAP OF JAPAN.

Dr. D. B. MCCARTEE, Washington, District of Columbia. 16862. '85. (II, A)

ETHNOLOGICAL OBJECTS. Basket hat, water jars (8), baskets (5), Berry wands (3), Berry trays (6), toy doll, cradle back, leather bag, and repairs of moccasins collected by Dr. H. C. Yarrow among the Gosh Utes, Utah.

BUREAU OF ETHNOLOGY, Washington, District of Columbia. 16863. '85. (II, A)

ANTIQUITIES, from France.

THOMAS WILSON, U. S. consul, Nice, France. 16864. '85. (III)

MATERIA MEDICA (18 specimens), from Jamaica, including *Amyris balsamifera*, *Mucuna pruriens*, *Cassia obovata*, *Calotropis gigantea*, *Rhizophora mangle*, *Ipomoea purga*, *Avicennia nitida*, *Gouania domingensis*, *Cissampelos Pereira*, *Cyperus articulatus*, *Capparis cynophallophora*, *Smilax china*, *Mikania guaco*, *Bocconia frutescens*, *Croton cascarilla*, *Andira inermis*, *Laguncularia racemosa*.

GOVERNMENT OF JAMAICA. 16865. '85. (I)

FLOWERS and foliage of papaw tree.*

GOVERNMENT OF JAMAICA. 16865. '85. (I)

FOODS,* from Jamaica.

GOVERNMENT OF JAMAICA. 16865. '85. (I)

ANNATTO SEEDS used as a dye,* from Jamaica.

GOVERNMENT OF JAMAICA. 16865. '85. (I)

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* Received from the New Orleans Exposition.

MAMMALS' SKINS, (8 specimens).
R. MACFARLANE, Fort Chippewyan, Hudson Bay Territory. 16866. '85. (IV)

BIRD-SKIN, *Logopus albus*, from Fort Resolution, Great Slave Lake.
R. MACFARLANE, Fort Chippewyan, Hudson Bay Territory. 16866. '85. (V, A)

NESTS AND EGGS (7 specimens).
R. MACFARLANE, Fort Chippewyan, Hudson Bay Territory. 16866. '85. (V, B)

DUFRENITE (136 specimens) strengite with cacoxenite in dufrenite (2 specimens).
Prof. M. B. HARDIN, Virginia Military Institute, Lexington, Virginia. 16867. '85. (XVI)

MASSIVE GARNET.
J. P. ELROD, Jefferson, Georgia. 16868. '85. (XVI)

DRY SHELLS from Florida and Honduras; for examination.
CHARLES T. SIMPSON, Braiden Town, Manatee County, Florida. 16869. '85 (IX)

MODELS, relief maps, etc.
U. S. GEOLOGICAL SURVEY and BUREAU OF ETHNOLOGY, Washington, District of Columbia. 16870. '87.

BOW, arrows, and quiver made of mountain-lion skin. (Purchased.)
HATHALI NEZ, "The Tall Singer," medicine-man. 16871. '85. (II, A)

IPSWICH SPARROW, *Passerculus princeps* (30 specimens), and Shore Lark, *Otocoris alpestris* (8 specimens).
C. W. CHAMBERLAIN, Boston, Massachusetts. 16872. '85. (V, A)

ROCK DRILL, "Eclipse" pattern, with pictures representing operation on the Washington Aqueduct.
INGERSOLL ROCK DRILL COMPANY, Park Place, New York. 16873. '85. (XVIII)

PORPOISE, *Delphinus delphis*, in the flesh.
JAMES R. HOBBS, Kitty Hawk, North Carolina. 16874. '85. (IV)

BIRD SKINS. A collection of 113 specimens, 57 species, including a new species each of *Polioptila* and *Cyclorhis*, from Cozumel Island and Temax, Yucatan.
GEORGE F. GAUMER, Merida, Yucatan. 16875. '85. (V, A)

RUSH, *Juncus effusus* L., and weed, *Polygonum amphibium* L., from a carp-pond.
JOHN T. IRION, Paris, Tennessee. 16876. '85. (XV)

HAIR-WORM, probably, *Gordius aquaticus*.
JOHN KING, Columbus, Georgia. 16877. '85. (XI)

MARINE INVERTEBRATES, consisting chiefly of crustacea.
N. GREBNITSKI, Bering Island. 16878. '85. (XI)

SHELLS, from Commander Islands, E. Siberia.
N. GREBNITSKI, Bering Island. 16878. '85. (IX)

MAMMALS, *Ziphius grebnitskii*, *Eumetophias stelleri*, *Orca* sp., *Ovis nivicolea*, *Enhydris eutris*, and *Odobœnus obesus* (skeletons).
N. GREBNITSKI, Bering Island. 16878. '85. (XII)

BIRD SKINS, *Melodes calliope*, *Phylloyseustes borealis*, *Erythrosterna albicilla*, *Motacilla lugens*, *Ampelis garrulus*, *Fringilla montifringilla*, *Charadrius squatarola*, *Pilidna pacifica*, *Limosa melanuroides*, *Oceanodroma furcata*, *Branta hutchinsi*, *Mareca penelope*, *Aythya fuligula* (16 specimens).
N. GREBNITSKI, Bering Island. 16878. '85. (V, A)

BIRDS' EGGS (25).
N. GREBNITSKI, Bering Island. 16878. '85. (V, B)

FISHES, *Muræoides*, *Tilesia*, *Bathymaster*, *Liparis*, *Cottus*, *Oligocottus*, *Gasterosteus*, *Anoplarchus*, *Oncorhynchus*, *Siphagonus*, *Hexagrammus*, *Hemilepidotus*, *Cyclopterus*, *Clupea*, *Osmerus*, *Salvelinus*, *Pleurogrammus*, etc.
N. GREBNITSKI, Bering Island. 16878. '85. (VII)

ESKIMO IMPLEMENTS, including clothing, axe used in lodging-houses, knife-belt made from reindeer teeth, bow and 2 arrows, fish-knife and hat made by woman.
J. W. JOHNSON, Fort Alexander, Alaska. 16879. '85. (II, A)

FOSSIL SHELLS. *Macoma sabula* Spgl., *Cardium grœnlandicum* L., *Amauropsis purpurea* Dall. Quaternary, in clay concretions.
J. W. JOHNSON, Fort Alexander, Alaska. 16879. '85. (IX)

STONE IMPLEMENTS. Knife, adzes (3), and celts (2).
J. W. JOHNSON, Fort Alexander, Alaska. 16879. '85. (III)

BIRD SKINS, from Nushagak (34 specimens).
J. W. JOHNSON, Fort Alexander, Alaska. 16879. '85. (V, A)

PIG-TAILED MONKEY, *Macacus pelops* ♀.
W. A. CONKLIN, Central Park menagerie, New York City. 16880. '85. (XII)

REEVES PHEASANT, *Phasianus reevesi* (mounted).
ZOOLOGICAL SOCIETY OF PHILADELPHIA. Philadelphia, Pennsylvania. (Through Arthur Edwin Brown, Esq.) 16881. '85. (V, A)

SCREEN, representing a Chinese wedding.
Mrs. J. L. HOLMES. (Through O. T. Mason.) 16882. '85. (II, A)

FOSSIL SHELL. *Axinaea* (?), from phosphate deposits, South Carolina.
R. RATHBUN, U. S. National Museum. 16883. '85. (IX)

SHARKS' TEETH (5), from phosphate deposits, South Carolina.
R. RATHBUN, U. S. National Museum. 16883. '85. (VII)

COACH DOG, *Canis familiaris* (skeleton).
LEWIS HIPKINS, Washington, District of Columbia. 16884. '85. (XII)

BIRD SKINS, collection of 139 species, 225 specimens from Turkey, France, India, South Africa, England, Asia Minor, Borneo, Pegu, British Burmah, Timor Laut, Papua, Australia, Malayan Peninsula, Brazil, and Peru. (Exchange.)
R. BOWDLER SHARPE, British Museum, South Kensington, England. 16885. '85. (V, A)

ANTIQUITIES, from France.
THOMAS WILSON, U. S. consul, Nice, France. 16886. '87. (III)

HATCHING-BOX for hatching white-fish and other small fry (model).
M. B. HILL, Clayton, New York. 16887. '85. (Sent to F. N. Clark, Northville, Michigan.)

METALS, for examination.
Dr. E. O. SAWYER, Point Pleasant, West Virginia. 16888. '85. (XVIII)

FISHES, *Pleuronectes stellatus*, *Cottus quadricornis*, *Coregonus merckii*, and *Clupea mirabilus*.
Capt. M. A. HEALY, U. S. R. M. steamer *Corwin*, San Francisco, California. 16889. '85. (VII)

TURNSTONE, *Strepsilas interpres*, from Alaska.
Capt. M. A. HEALY, U. S. R. M. steamer *Corwin*, San Francisco, California. 16889. '85. (V, A)

MARINE INVERTEBRATES, from Alaska.
Capt. M. A. HEALY, U. S. R. M. steamer *Corwin*, San Francisco, California. 16889. '85. (X, I)

FISHES, *Gymnacanthus galeatus*, *Potamocottus gulosus*, *Cottus*, *Oligocottus*, *Aspidocottus*, *Xiphister*, *Muraenoides*, *Podothecus*, *Sabastichthys*, etc. (28 species) from Alaska and one species from Chili.
T. H. STREETS, Passed Assistant Surgeon, U. S. Navy, steamer *Carlisle Patterson*, 16890. '85. (VII)

MARINE INVERTEBRATES, from Alaska.

T. H. STREETS, Passed Assistant Surgeon, U. S. Navy, steamer *Carlisle Patterson*. 16890. '85. (XI)

COMMON LITTORAL SHELLS, from Alaska.

T. H. STREETS, Passed Assistant Surgeon, U. S. Navy, steamer *Carlisle Patterson*. 16890. '85. (IX)

REPTILES, *Diemyctylus torosus* and *Amblystoma decorticatum*, from Alaska.

T. H. STREETS, Passed Assistant Surgeon, U. S. Navy, steamer *Carlisle Patterson*. 16890. '85. (VI)

LABRADORITE, a lime soda feldspar.

GEORGE W. WATKINS, Moriah, Essex County, New York. 16891. '85. (XVIII)

DRIED LIZARD, from near Ciudad, Bolivia.

F. A. LUCAS, U. S. National Museum. 16892. '85. (VI)

AFRICAN FIGURES, 2 mannikins prepared under the direction of Prof. Hamy, Trocadero Museum. (Purchased.)

JULES HEBERT, 9, rue Henri Martin, Paris, France. 16893. '85. (II, A)

SHELLS. Twenty-three specimens.

CHARLES W. JOHNSON, Saint Augustine, Florida. 16894. '85. (IX)

OBSIDIAN.*

COMMISSIONER OF NEW MEXICO. 16895. '85. (II, A)

OBSIDIAN and pumice stone, for examination.

Dr. T. S. SNOW, Baker City, Oregon. 16896. '85. (XVI)

MICROSCOPE and accessories, old pattern.

SMITHSONIAN INSTITUTION. 16897. '85. (I)

FISH DECOY used by fishermen of the Great Lakes in connection with spearing trout.

Dr. TRUMFOUR, Mackinaw, Michigan. 16898. '85. (I)

WHITEFISH FLOATS, three forms, and one sinker.

WILLIAM SMITH, Frankfort, Michigan. 16899. '85. (I)

TROUT BOBBING LINE, rigged for use.

KINSLEY G. HOUSE, Oconto, Wisconsin. 16900. '85. (I)

SALAMANDERS, *Amblystoma tigrinum* juv (27).

Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 16901. '85. (VI)

CONCRETION.

JOHN W. CLARK, Nushagak, Alaska. 16902. '85. (XVII)

IVORY CARVING representing an Eskimo dance, made by a native.

JOHN W. CLARK, Nushagak, Alaska. 16902. '85. (II, A)

BLACK DUCK, *Anas obscura* (Mallard variety). A strange freak of color, approaching an albino state.

RUSSELL ROBINSON, Richmond, Virginia. 16903. '85. (V, A)

BIRD SKINS, *Centropus eurycercus*, from Borneo; *Platycichla flaripes*, *Spinus cucullatus*, and *Sporophila* sp., from Venezuela (7 specimens).

H. K. COALE, Chicago, Illinois. 16904. '85. (V, A)

BLOCK OF LAVA, from Vesuvius.

Mrs. EDGAR DAWSON, Baltimore, Maryland. 16905. '85. (I)

BIRD'S NEST, from Bladensfield, near Warsaw, Virginia.

Mrs. MARY BURR, care Mrs. M. V. Burr, General Land Office. 16906. '85 (V, B)

ORE, for examination.

WILLIAM E. GREEN, Troy, Alabama. 16907. '85. (XVIII)

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* Received from New Orleans Exposition.

BROOK TROUT, *Salvelinus fontinalis.*
A. F. WOOSTER, Norfolk, Connecticut. 16908. '85. (VII)

CANNISTER SHOT and minnie balls, from battlefield of Bull Run, Virginia.
H. M. SMITH, U. S. National Museum. 16909. '85. (I)

COQUINA, shell-rock, from the Spanish fort at Saint Augustine, Florida.
A. ZENO SHINDLER, U. S. National Museum. 16910. '85. (I)

DRIED SKIN of a species of *Ophichthys*, from Bermuda.
Dr. F. M. HAMLIN, Auburn, New York. 16911. '85. (VII)

PHOTOGRAPHS from negatives of views in Southeast Alaska.
A. P. NIBLACK, Ensign, U. S. N. 16912. '85. (II, A)

MAMMALS, *Urocyon virginianus* ♂, *Neotoma floridana* ♂, *Arvicola riparius* ♂, *Spermophilus grammurus*, *Tamias asiaticus Townsendii*, *Spermophilus grammurus*, *S. grammurus Douglassi* and *Lepus sylvaticus auduboni* (21 specimens).
WALTER E. BRYANT, Oakland, California. 16913. '85. (IV)

"BIDARKA," or skin canoe, with paddles, from Alaska.
CHARLES H. TOWNSEND, U. S. Fish Commission. 16914. '85. (II, A)

FOSSIL SHELLS, from Alaska.
CHARLES H. TOWNSEND, U. S. Fish Commission. 16914. '85. (IX)

ACTINIANS, from Alaska.
CHARLES H. TOWNSEND, U. S. Fish Commission. 16914. '85. (XI)

BIRD SKELETONS, *Circus hudsonius*, *Larus glaucus*, *Diomedea nigripes*, *Corvus caurinus*, *Tinnunculus sparverius*, and *Lomvia arra*, from Alaska.
CHARLES H. TOWNSEND, U. S. Fish Commission. 16914. '85. (XII)

MAMMALS, *Erethrizon dorsalis epixanthus*, *Thalarctos maritimus*, *Sciurus hudsonius*, *Eumotopias stelleri*, *Callorhinus ursinus*, and *Enhydris lutris* (bones), from Alaska.
CHARLES H. TOWNSEND, U. S. Fish Commission. 16914. '85. (XII)

BIRDS. A collection of 152 specimens, from Ounalashka Island, St. Paul's Island, Otter Island, Port Clarence, Kotzebue Sound, St. Matthews' Island, and St. George Island. The rarest or most important are the following: Kennicott's Warbler (*Phylloscopus borealis*), Alaskan Wren (*Troglodytes alascensis*), Kowak Chickadee (*Parus stoneyi*, n. sp.).*
CHARLES H. TOWNSEND, U. S. Fish Commission. 16914. '85. (V, A)

In addition to these were good series of such characteristic or peculiar Alaskan birds as *Leucosticte griseonucha*, *Melospiza cinerea*. McKay's Snowflake (*Plectrophanes hyperboreus*), Prybilov Snowflake (*P. nivalis townsendi*, n. subsp.), and Long-toed Stint (*Tringa damacensis*†).

ERMINE, *Putorius erminea*, in the flesh.
A. R. DODGE, East Saginaw, Michigan. 16915. '85. (IV)

BIRD SKINS. Chewink (Towhee), *Pipilo erythrophthalmus*, and Kingbird (Bee Martin), *Tyrannus carolinensis.*
LEWIS B. WOODRUFF, 14 East Sixty-eighth street, New York. 16916. '85. (V, A)

NESTS AND EGGS of Chewink (Towhee), *Pipilo erythrophthalmus*, and of Kingbird (Bee Martin), *Tyrannus carolinensis.* Set of four eggs in each. Collected at Litchfield, Conn., June, 1885.
LEWIS B. WOODRUFF, 14 East Sixty-eighth street, New York. 16916. '85. (V, B)

FOSSIL PLANTS. (Returned.)
R. P. SHARPLES, Phœnixville, Pennsylvania. 16917. '85. (XIX)

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*A young bird; characters of the species first clearly shown by Lieutenant Stoney's adult examples.

† New to North American fauna.

INVERTEBRATE FOSSILS.

R. P. SHARPLES, Phœnixville, Pennsylvania. 16917. '85. (XIII, B)

BURNT CLAY, found in a mound in Arizona, and bearing impressions of sticks, twigs, etc. (16 specimens).

D'. EDWARD PALMER, Smithsonian Institution. 16919. '85. (III)

ROUGH OCTOPUS, *Octopus rugosus*, Bosc.

A. R. AKEN, Cat Island Light-house Bay, Saint Louis, Missouri. 16920. '85. (IX)

FAT HEAD, *Pimephales promelas* (5 specimens), from an artesian well.

LOUIS LAGER, Aberdeen, Idaho Territory. 16921. '85. (VII)

RHINOCEROS HORNBILL, *Buceros bicornis*.

W. A. CONKLIN, Central Park Menagerie, New York City. 16922. '85. (XIII)

ARSENICAL IRON PYRITES and garnet, from the Black Hills; for examination and report.

H. I. BROWN, Ponca, Nebraska. 16923. '85. (XVI)

MAMMAL SKINS from Queensland and Tasmania, as follows: (1) *Macropus giganteus* Schreb., ♂ and ♀; (2) *M. robustus* Gld., ♂ and ♀ (juv.); (3) *M. rufus* Desm., ♂ and ♀; (4) *M. parryi* Ben., ♀; (5) *Halmaturus dorsalis* Gr., ♂ and ♀; (6) *H. ruficollis* Desm., ♂; (7) *H. temporalis* De Vis, ♂; (8) *H. thetidis* F. Cuv. ♀; (9) *Petaaurista taguanoides* Desm., ♀; (10) *Dasyurus maculatus* Shaw, ♀; (11) *D. geoffroyi* Gld. ♀ (mounted); (12) *Phascolomys wombatus* Per. et Less., Tasmania; (13) *Phascolarctos cinereus* Goldf., ♂ and ♀; (14) *Bettongia rufescens* Waterh., ♂ and ♀; (15) *Ornithorhynchus paradoxus* Blum.; (16) *Hydromys chrysogaster* Geof., ♀; (17) *Pteropus scapulatus* Peters. All Queensland specimens except No. 12.

QUEENSLAND MUSEUM, Brisbane, Queensland. 16924. '85. (IV)

PHOSPHATES, from the High Rock Phosphate Mine.

HIGH ROCK PHOSPHATE MINE. (Through Walter W. Pickford, manager), Buckingham, Province of Quebec, Canada. 16925. '85. (XVIII)

BONNETED MACAQUE, *Macacus sinicus* ♂.

W. A. CONKLIN, Central Park Menagerie, New York City. 16926. '86. (IV)

INDIAN TORTOISE.

W. A. CONKLIN, Central Park Menagerie, New York City. 16926. '85. (VI)

CAST OF STONE DISK, with carvings. Originally found near Plymouth, Marshall County, Indiana.

GEORGE A. BAKER, 102 South Michigan street, South Bend, Indiana. 16927. '85. (III)

CARPET, made by the Navajo weavers for Thomas Keam, and said to be the most elaborate and costly piece of work ever undertaken by the Navajos. Valued at $250. (Deposited.)

THOMAS KEAM, Keam's Cañon, Arizona. 16928. '85. (II, A)

MODEL OF WEJEGI, one of the Chaco ruins, prepared under the direction of the Bureau of Ethnology. The model measures about 3 feet by 4 feet, and the subject is one of the ruins of the Pueblo class.

BUREAU OF ETHNOLOGY, Smithsonian Institution. 16929. '85. (II, A)

SALT, cleavage specimen, from Petite Anse, Louisiana.

JOHN M. AVERY, New Iberia, Louisiana. (Through U. S. Geological Survey. 16930. '85. (XVI)

LAUMONTITE, from Jones' Falls, Baltimore, Maryland. (Exchange.)

Dr. F. M. CHATARD, Baltimore, Maryland. (Through Joseph Willcox.) 16931. '85. (XVI)

BARITE (2 specimens), from Dufton, England. (Exchange.)
JOSEPH WILLCOX, Media, Pennsylvania. 16932. '86. (XVI)

WOOD. Section of a pile from a wharf at Cape Henry, Virginia, completely riddled by the boring of the ship-worm, *Teredo navalis*.
A. B. JOHNSON, Light-House Board. 16933. '85. (IX)

CRYSTALS (3), from deposit near Moriah, Essex County, New York.
GEORGE W. WATKINS, Moriah, New York. 16934. '85. (XVI)

DRIED POTATO.
C. O. STILLWELL, Rome, Georgia. 16935. '85. (I)

MAMMALS: *Neotoma floridana*, *Thomomys talpoides umbrinus*, *Arvicola riparius*, *Perognathus penicillatus*, *Hesperomys leucopus*, and *Tamias asiaticus*, between *townsendi* and *quadrivittatus*.
FRANK E. BLAISDELL, Poway, San Diego County, California. 16936. '85. (IV)

LOCO WEED, *Astragalus Bigelowi* Gray, probably from Texas.
Dr. W. THORNTON PARKER, Newport, Rhode Island. 16937. '85. (XV)

GRANITE (2 specimens), and one each of hornblende and red clay.
LARKIN KING, San Saba, Texas. 16938. '85. (XVI)

HORNBLENDE gneiss, containing epidote; for examination and report.
CHARLES MILLER, jr., P. O. Box 95, Sanborn, New York. 16939. '85. (XVII)

SLATE (2 specimens) and impure limonite; for examination and report.
C. P. MCGIMSEY, Arkadelphia, Arkansas. 16940. '85. (XVI)

BRACELETS, of turtle-shell, made at Nassau, N. P., Bahamas, West Indies.
Mrs. EPES SARGENT, 338 Pennsylvania avenue, Washington, District of Columbia. 16941. '85. (I)

BROWN IRON ORE; for examination and report.
C. D. GALVIN, New York City. 16942. '85. (XVI)

MUSICAL INSTRUMENT. Chinese sanheen, in exchange for carvings and baskets of North American Indians.
J. H. RENSHAW, U. S. Geological Survey. 16943. '85. (II, A)

GALENA, Sulphide of lead, for examination and report.
OLIVER RASE, Ivanpah, San Bernardino, California. 16944. '85. (XVI)

CHAMOIS HORN. Material furnished by the Museum and mounted by Mr. Kaldenberg as a paper-knife.
F. J. KALDENBERG, 124 Fulton street, New York. 16945. '85. (I)

FLINT IMPLEMENTS. Collection of 109 specimens on nine tablets, including arrow-heads, spear-heads, and darts; from Flint Ridge, Muskingum County, Ohio. This collection is made up from findings in the western part of the county. The flint and quartz work of which they are made is found in the above neighborhood in a ridge or row of hills, known in the locality as Flint Ridge. As this peculiar rock formation is the only one of the kind in this section, it must have furnished the supply of material for the manufacture of these darts and spear-heads for a large scope of country.
T. F. SPANGLER, Jamesville, Ohio. 16946. '85 (III)

SHELLS (71 species), types of paper on Alaskan shells, and 30 species of marine shells from Norway.
Dr. A. KRAUSE, Berlin, Prussia. (Through William H. Dall.) 16947. '85. (IX)

AMPHIPOD CRUSTACEAN; serves as food for mackerel.

W. A. WILCOX, Gloucester, Massachusetts. 16948. '85. (XI)

ROCKS.

Mrs. H. C. BECKWITH, Coleman Station, New York. 16949. '85. (XVII)

STONE IMPLEMENTS from France.

THOMAS WILSON, Washington, District of Columbia. 16950. '85. (III)

ORE from Rockbridge, Virginia; for report.

S. H. LETCHER, Lexington, Virginia. 16951. '85. (XVIII)

LAUGHING GULL, *Larus atricilla*, juv.

E. C. GREENWOOD, Nantucket, Massachusetts. 16952. '85. (V, A)

INDIAN BASKET, etc.: Specimens of corn-husk basketry, clothing, and weapons of the Shetimasha Indians, and specimen of basketry of the Choctaw Indians. Also specimens of Naukin cotton and decorticated moss work.*

C. J. BARROWS, commissioner for Louisiana at New Orleans Exposition. 16953. '85. (II, A)

TEXTILES exhibited at the New Orleans Exposition.

EAGLE AND PHŒNIX MILLS, Columbus, Georgia. (Through Dr. Bursy, president.) 16954. '85. (I)

NEGRO MANUFACTURES: Basketry, clothing, tupelo gum, handiwork of the negroes.

JAMES J. SPELMAN, superintendent Colored People's Exhibit, New Orleans, Louisiana. 16935. '85. (II, A)

PUMP DRILL:*

JAMES J. SPELMAN, superintendent Colored People's Exhibit, New Orleans, La. 16955. '85. (II, A)

INDIAN IMPLEMENTS, etc., basketry, cradles, water jug, and seeds, from Ute Indians, of Nevada.

W. M. HAVEROR, Reno, Nev. (acting for Nevada at the New Orleans Exposition). 16956. '85. (II, A)

FISH TRAP, used in Venezuela.*

E. MARTINEZ, representative of Venezuela at the New Orleans Exposition. 16957. '85. (I)

PALMETTO HATS.*

Mrs. S. G. FOWLER, Handsborough, Mississippi. 16958. '85. (II, A)

CORN-SHUCK HAT.*

Miss ELLEN CLEARY, Handsborough, Mississippi. 16959. '85. (II, A)

FEATHER-WORK.*

MILTON J. FLOOD, Sterling, Massachusetts. 16960. '85. (I)

NEGRO MANUFACTURES: Horse collars, trays of the tupelo gum, and specimens of basketry, made by the negroes of Mississippi.*

General STEPHEN D. LEE and Professor PHARES. Mississippi 16961. '85. (II, A)

BROOMS, made from the young leaves of palmetto; from Jamaica.*

GOVERNMENT OF JAMAICA. 16962. '85. (II, A)

COAL.

STEPHEN GRAY, JR., Olympia, Bath County, Kentucky. 16963. '85. (XVIII)

PLANTS, from Nevada.*

Hon. R. W. FURNAS, commissioner from Nebraska, Brownsville, Nebraska. 16964. '85. (XV)

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* Received from the New Orleans Exposition.

CLAY, for examination and report.
W. A. SPENCE, Jacksonville, Florida. 16965. '85. (XVIII)

MINERALS. One rock carrying iron pyrites and one slightly stained with copper.
M. A. TEAL, Riverside, San Bernardino County, California. 16966. '85. (XVI)

BIRDS' EGGS. Cardinal Grosbeak, *Cardinalis virginianus;* Saint Lucas Cardinal, *Cardinalis virginianus igneus;* White-rumped Shrike, *Lanius ludovicianus excubitoroides.*
ROSWELL WHEELER, Jr., Sacaton, Arizona. 16967. '85. (V, B)

COLLIE BITCH ("Vesta"), *Canis familiaris*, from Glencoe Collie kennels.
H. T. LEEPEY, Glencoe Collie kennels, Bethlehem, Pennsylvania. 16968. '85. (XII)

EVENING GROSBEAK, *Hesperiphona vespertina.*
WILL H. WALKER, 33 Yamhill street, Portland, Oregon. 16969. '85. (V, A.)

COREAN POTTERY. Twenty-five pieces of table crockery, bottles, water-jar, wine-cup, etc. Some of the pieces are from three hundred to seven hundred years old. From Corea.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (I)

DRUGS from Corea (3 specimens).
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85 (I)

MUSICAL INSTRUMENT. A stringed instrument, seemingly a combination of the Chinese kin and the Japanese koto. From Corea.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (I)

FABRICS, from Corea.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (I)

ETHNOLOGICAL OBJECTS, from Corea.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (II, A)

FISHES, including *Stromateus, Squalus, Scomberomorus, Niphon, Saurida, Clupea, Platycephalus, Tetrodon, Solea, Corvina, Sciæna, Mugil*, etc.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (VII)

TURTLE, from Corea.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan, 16970. '85. (VI)

CEPHALOPODS (4 specimens), from Corea.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (IX)

MARINE INVERTEBRATES, from Corea,
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (XI)

SLAB OF MARBLE, 10 by 20 inches, disk of yellow marble, stone pencil, jar of yellow and green marble, box made of red stone, from Corea.
J. B. BERNADOU, Ensign, U. S. Navy, Nagasaki, Japan. 16970. '85. (XVII)

POTTERY.
D. F. HAYNES & Co., Baltimore, Maryland. 16971. '85. (I)

SIAMESE SILVER COIN, 1 fuang = 7½ cents. (Deposited.)
JOHN M. NOAH, U. S. National Museum. 16972. '85. (I)

DIATOMACEOUS EARTH, from Massaponax, Spottsylvania County, Virginia.
ROBERT P. BIGLOW, Washington, District of Columbia. 16973. '85. (XI)

STONE IMPLEMENTS. A leaf-shaped implement, a spear-head, 147 arrow-heads, 2 grooved axes, a stone slab with mortar cavities on both sides, a fragment of pottery, and 18 fragments of stone implements, from Massaponax, Spottsylvania County, Virginia.
ROBERT P. BIGLOW, Washington, District of Columbia. 16973. '85. (III)

ANTIQUITIES. A skull and bones from an Indian grave, and a clay pipe, one-half of a small clay vessel, and 5 copper beads, from a mound near Warner's Landing, Vernon County, Wisconsin. Also a leaf-shaped implement, with a handle attached.

Dr. J. L. DE WITT, Newton, Vernon County, Wisconsin. 16974. '85. (III)

CONE-IN-CONE, a peculiar concretionary form.

Dr. J. L. DE WITT, Newton, Vernon County, Wisconsin. 16974. '85. (XVII)

INVERTEBRATE FOSSIL, *Ostrea congesta.*

Dr. J. L. DE WITT, Newton, Vernon County, Wisconsin. 16974. '85. (XIII, B)

FOSSIL SHELLS, specimens of *Chonetes* and *Productus*, with sections of crinoid stems.

M. J. BECKER, Fort Scott, Kansas. 16975. '85 (IX)

MONKEY, CERCŒBUS sp. (?), specimen in the flesh.

H. B. EVERETT, Dime Museum, city. 16976. '85. (IV)

EARTH, for examination.

JOHN BROOKS, Hedrick, Rush County, New York. 16977. 8'5. (?)

TAPA CLOTH, Samoan Islands, 1869.

Lieut. Commmander CHARLES V. GRIDLEY, U. S. Navy; U. S. steamer "Kearsage." 16978. '85. (II, A)

ROCKS. A collection of over 100 specimens, including diorites, diabases, gabbros, syenite, granite, gneiss, mica-schist, quartz, quartz-porphyry, slate; also a vertical column showing relative age and comparative thickness of the Archæan, Cambrian, and Silurian formations of this slate, etc., from New Hampshire.

C. H. HITCHCOCK, Hanover, New Hampshire. 16979. '85. (XV)

SHELLAC, crude and commercial, and articles showing its use.

THOMAS DONALDSON, Philadelphia, Pennsylvania. 16980. '85. (I)

RED GRANITE.

H. D. GURNEY, Saint Paul, Minnesota. 16981. '85. (XVII)

COKE.

H. SIMON, 20 Mount street, Manchester, England. 16982. '85. (XVIII)

GREY CORUNDUM and kyanite, from Georgia. (Exchange.)

N. P. PRATT, Atlanta, Georgia. 16983. '85. (XVI)

BRONZE MEDAL. Annual Assay of the Mint, 1776–1876.

WM. J. GREEN, U. S. National Museum. 16984. '85. (I)

DEER, *Cervus axis*, three days old.

W. A. CONKLIN, Central Park Menagerie, New York City. 16985. '85. (IV)

RED TAILED BUZZARD, *Buteo borealis*, from Fayette County, Kentucky.

T. H. MORGAN, Broadway, Lexington, Kentucky. 16986. '85. (V, A)

STEAM-TRANSPORTATION. Drawings, pieces of iron rail, castings, etc.

PENNSYLVANIA RAILROAD COMPANY, Camden, New Jersey. (Through J. E. Watkins.) 16987. '85. (I)

COKE.

H. SIMON, 20 Mount street, Manchester, England. 16988. '85. (XVIII)

BIRDS. A collection of 171 specimens, 68 species, mostly from the Old World. Amongst these may be especially mentioned a good series (22) of Red-polls (*Acanthis*), *A. linaria*, from western Siberia and Japan; *A. caberet*, from England, and *A. exilipes*, from western Siberia. The greater part of the collection, however, consists of water birds.

HENRY SEEBOHM, London, England. 16989. '85. (V, A)

* DECORATED OSTRICH EGG and two feather fans. 16990. '85. (I)

* Received from New Orleans Exposition through Department of State.

* GLASSWARE.
LUDWIG MOSER, Carlsbad, Bohemia. 16991. '85. (I)

BIRDS EGGS (3), of Ruby-crowned Kinglet, *Regulus calendula*. from New York.
DWIGHT D. STONE, New York. 16992. '85. (V, B)

* GUMS AND DYES, from Mexico.
MEXICAN COMMISSION. 16993. '85. (I)

ANIMAL PRODUCTS.* Shark's skin, furs, hair ropes, small sieve, and dried insects, from Mexico.
MEXICAN COMMISSION. 16993. '86. (I)

FOODS.*
MEXICAN COMMISSION. 16993. '85. (I)

ETHNOLOGICAL OBJECTS* of basketry, clothing, horse equipments, bedding, carpeting, etc., from Mexico.
MEXICAN COMMISSION. 16993. '86. (II, A)

TEXTILES,* wool and fabers, from Mexico.
MEXICAN COMMISSION. 16993. '85. (I)

GEOLOGICAL MAPS* (11) from Belgium.
BELGIAN COMMISSION. 16994. '85. (XVII)

BOX,† carved out of talc by a native of Bombay. 16995. '85. (XVI)

WOODS † (20 samples). 16995. '85. (XV)

ETHNOLOGICAL OBJECTS. † Carved olive-wood, carved stone from the river Jordan, and two pairs of shoes. 16995. '85. (II, A)

PAPER * (38 samples), fine white and colored ceiling-paper, from Duren, Province of Rhine.
FELIX HCH. SCHOELLER, Durin, Province of Rhine. 16996. '85. (1)

STEATITE, chrysocolla, cerargyrite, embolite, etc., from Sonora, Mexico.
GOVERNOR OF SONORA, Mexico. (Through Victor Aguilar). 16997. '85. (XVI)

GOLD AND SILVER ORES.*
GOVERNOR OF SONORA, Sonora, Mexico. 16997. '86. (XVIII)

EARTHENWARE FLUTE,* painted gourd rattle, and violin, from Chiapas, Mexico.
COMMISSIONER OF CHIAPAS, Mexico. 16998. '85. (I)

LIMONITE (1 specimen) and 4 specimens of coral altered into chalcedony.
S. T. WALKER, Milton, Florida. 16999. '85. (XVI)

ROCKS,* concretions, and fulgurites (8 specimens).
S. T. WALKER, Milton, Florida. 16999. '85. (XVII)

CRUSTACEÆ from Caribbean Sea.
Prof. S. I. SMITH, New Haven, Connecticut. 17000. '85. (XI)

GOLD AND SILVER ORES.*
M. AGILLA, Sonora, State of Sonora, Mexico. 17001. '85. (XVIII)

ORES* from Durango, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17002. '85. (XVIII)

ORES* from Guerrero, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17003. '85. (XVIII)

ORES* from the State of Michoacan, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17004. '85. (XVIII)

ORES* from the State of Oaxaca, Mexico,
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17005 '85. (XVIII)

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* Received from New Orleans Exposition.
† Received from New Orleans Exposition through Department of State.

ORES* from the State of Mexico, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17006. '85. (XVIII)

ORES* from the State of Tlascala, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17007. '85. (XVIII)

ORES* from the State of Puebla, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17008. '85. (XVIII)

ORES* from the State of San Luis Potosi, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17009. '85. (XVIII)

ORES* from the States of Vera Cruz, New Leon, Jalisco, Chiapas, and Chihuahua, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17010. '85. (XVIII)

ORES* from the State of Hidalgo, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17011. '85. (XVIII)

ORES* from the State of Hidalgo, Mexico.
Señor MANUEL DROCINO, Pachuca, Hidalgo, Mexico. 17012. '85. (XVIII)

SILVER ORES.* Also a very complete illustration of the Real del Monte Mining Company's works; exhibited at the New Orleans Exposition.
REAL DEL MONTE MINING COMPANY, Pachuca, Mexico. (Through José de Landero y Cos.) 17013. '85. (XVIII)

ORES* from the State of Zacatecas, Mexico.
Señor BONILLA, in charge of observatory of Zacatecas, Zacatecas, Mexico. 17014. '85. (XVIII)

COPPER ORES* from the State of Aguas Calientes, Mexico.
Señor BONILLA, in charge of observatory of Zacatecas, Zacatecas, Mexico. 17015. '85. (XVIII)

EUSYNCHITE* (Tritochorite or Ramirite), from the State of San Luis Potosi, Mexico.
Señor AGUILLERA. 17016. '85. (XVI)

STONEWARE,* jugs, spirit bottles, etc.
PORT DUNDAS POTTERY COMPANY, Glasgow, Scotland. 17017. '85. (1)

STATUETTES.† "Sunshine" and "Storm," from Staffordshire, England.
ROBINSON AND LEADBEATER, Stoke-upon-Trent, Staffordshire, England. 17018. '85. (1)

FIGURE OF A PIG,* in burnt clay.
ARKANSAS COMMISSIONER. 17019. '85. (1)

BOATS.† Four large models.
JOHN W. PARRY, Sarnia, Ontario, Canada. 17020. '86. (1)

PYRRHOTITE† (1 specimen), and Micaceous Hematite (1 specimen), from Sweden. 17021. '85. (XVI)

EURITE (Halleflint gneiss) (4 specimens), from New Hopperberg, Westmorland, Sweden, and 2 specimens of Halleflint, from Dannemora Mine, Upland, Sweden. 17021. '85. (XVII)

ORES† from Sweden.
17021. '85. (XVIII)

APATITE† (5 specs.) from Kingston, Ontario.
17022. '86. (XVI)

ORES† from Kingston, Ontario.
17022. '85. (XVIII)

COAL† from Japan.
17023. '86. (XVIII)

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*Received from New Orleans Exposition.
†Received from New Orleans Exposition through Department of State.

MINERALS* from Costa Rica.
17024. '86. (XVIII)

BRICKS AND TILES* from Mexico.
17025. '85 (I)

FIBERS,* ropes, etc., from Hayti.
GOVERNMENT OF HAYTI. 17026. '85. (I)

OIL PORTRAITS† of Haytian chiefs (1804–1885). Also baskets, whips, etc.†
GOVERNMENT OF HAYTI. 17026. '85. (II, A)

POTTERY* from Hayti.
GOVERNMENT OF HAYTI. 17026. '85. (I)

SPONGES‡ (2 specs.) found growing together; both recent; from near Key West, Florida.
W. H. SEBRING, commissioner for Florida. 17027. '85. (XI)

RAW SILK.‡ Three hanks, the product of the Yama Mai, the wild-oak silk-worm of Japan; also two cocoons.
COMMISSIONER FOR YEHIME, Japan. 17028. '85. (I)

SOUVENIR OF CANADIAN SPORTS.* Miniature snow-shoes, toboggan, and Lacrosse racquet.
17029. '85. (II, A)

SLAB OF TRAVERTINE MARBLE‡ from Tecali, Puebla, Mexico.
MEXICAN GEOGRAPHICAL AND EXPLORING COMMISSION. 17030. '86. (XVI)

FERNS,‡ 2 sets, each containing 110 species, some of which are new to science, and all new to the collection.
17031. '86. (XV)

MODEL of Mississippi River Steam-boat.‡
E. C. CARROLL, Vicksburg, Miss. 17032. '85 (I)

COAL* from Norway.
17033. '86. (XVIII)

ASPHALTUM* from Scotland.
17034. '86. (XVIII)

ORES from Mexico.*
17035. '86. (XVIII)

NUGGETS AND ORES* (fac-similes), from Australia.
17036. '86. (XVIII)

DRUM* from Costa Rica.
17037. '86. (I)

LEAF TOBACCO* from Java.
17037. '85. (I)

ETHNOLOGICAL OBJECTS* from Hawaiian Island, including school-books, photographs of King and Queen, and scenery about the island; tapa cloth, reticule, and necklace of koa seeds, necklace of kukui seeds (candle-nut seeds); 2 flags, and a native drum made from a koa log and covered with hog's hide. Also 6 specimens of wood.
HAWAIIAN GOVERNMENT. 17038. '86. (II)

POLIO,* a food made of toasted grain and salt, and ground for use.
17039. '86. (I)

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* Received from New Orleans Exposition through Department of State.

† For further information concerning this accession see Report on Department of Ethnology, page 94.

‡ Received from New Orleans Exposition.

ULTRAMARINE (8 bottles), from Hessen, Germany.
BLAUFARBENWERK MARIENBERG, Bensheim, Grossh. Hessen, Germany. 17040. '85. (I)

SPOONS,* ladles, three pairs of shoes, etc.
Hon. JACOB SCHOENHOF, U. S. Consul, Tunstall, England. 17041. '86. (II, A)

DRY OCHRE* (11 bottles) from Marseilles, France.
Hon. FRANK H. MASON, U. S. Consul, Marseilles. 17042. '86. (I)

ORES,* from Canada.
17043. '85. (XVIII)

SALTS,* from Germany.
17044. '85. (XVIII)

GOLD ORES,* from the Idaho Mine, California.
17045. '85. (XVIII)

SURGICAL DRESSINGS,* in use in German hospitals.
17046. '85. (I)

MILITARY AND WOOLEN GOODS,* from Germany.
17047. '85. (I)

ETHNOLOGICAL OBJECTS,* straw hats, common test cups, carved test cups, stands for test cups, common guacles, carved guacles, crupper, saddle-bags, silk and cotton rebosa, sample of cloth manufactured in Leon, samples of pita fiber extracted by machinery and by use of solvent, and cloth hammock with cabaya rope, native pottery, plow, yoke for oxen, cake of sugar, and ear-rings made of cayol nut.
H. H. LEAVITT, U. S. Consul, Managua, Nicaragua. 17048. '86. (II, A)

CHROMOS,* historical, geographical, etc., 4 portfolios.
EDWARD HOLZEL, Vienna, Austria. 17049. '86. (I)

SILVER MODEL* of Shandon Church, Ireland. (Returned.)
WILLIAM EGAN & SONS, Cork, Ireland. 17050. '85. (I)

BUTTER-BALL DUCK, *Charitonella albeola.*
HENRY PETERS, St. John's Ward, Enterprise, Florida. 17051. '86. (V, A)

MUD-FISH, *Amia calva.*
M. WILSON, Washington, District of Columbia. 17052. '86. (VII)

PYROLUSITE.
Mrs. W. H. FELTON, Centreville, Georgia. 17053. '86. (XVI)

STONE BLOCKS.
Pennsylvania Railroad Company. 17054. '86. (I)

MERGANSER, *Merganser americanus*, from near Mt. Vernon, Virginia.
HUGH M. SMITH, U. S. National Museum. 17055. '86. (V, A)

IRON PYRITES, with quartz and calcite.
F. C. HIETT, North River Mills, Hampshire County, West Virginia. 17056. '86. (XVI)

WOODEN MASKS, from Alaska.
LIEUT. T. DIXBOLLES, U. S. Navy. 17057. '86. (II, A)

ROSE FISH, *Sebastes marinus.*
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17058. '86. (VII)

MARINE FOSSIL SHELLS, Post Pliocene, including *Ostrea palmula* Cpr., *Anomia limatula* Dall., *Pecten aquisulcatus* Cpr.
Dr. STEPHEN BOWERS, San Bernardino, California. 17059. '86. (IX)

PEBBLES OF CHALCEDONY from quicksand in a well, 38 feet deep.
L. S. DANIEL, Victoria, Texas. 17060. '86. (XVII)

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* Received from New Orleans Exposition through Department of State.

AUTOGRAPH LETTER of Prof. Joseph Henry, dated Baltimore, June 10, 1842.
W. A. SMITH, 104 Pearl street, New York. 17061. '86. (I)

QUARTZ, from the Ozark Mountains, Arkansas.
CHARLES F. BROWN, Hot Springs, Arkansas. 17062. '86. (XVI)

MINERALS.
C. U. SHEPARD, Charleston, South Carolina. 17063. '86. (XVI)

SECTION OF IRON RAIL.
PENNSYLVANIA RAILROAD COMPANY, Camden, New Jersey. (Through J. E. Watkins.) 17064. '86. (I)

CATLINITE.
N. H. WINCHELL, Minneapolis, Minnesota. 17065. '86. (XVII)

MOLLUSK, a species of *Amnicola*, from Florida.
R. ELLSWORTH CALL, Moline, Illinois. 17066. '86. (IX)

FRESH-WATER SHELLS.
A. G. WETHERBY, Saint Andrew's Bay, Florida. 17067. '86. (IX)

MOLLUSKS, from the Gulf of Mexico.
Dr. W. H. RUSH, U. S. C. S. steamer *Blake*. 17068. '86. (IX)

INDIAN IMPLEMENTS. Stone pipe, wooden stem, pipe-stems, clarionet, pipe, short spear, two bows and 30 iron-pointed arrows, quiver and 8 arrows, tomahawk, pipe, rattle, spoon, head-dress, mail, and war clubs, captured from the Sioux Indians at the battle of White Stone Hill by the Second Nebraska Cavalry, September 3, 1863.*
Gov. R. W. FURNAS, Commissioner for Nebraska at the New Orleans Exposition. 17069. '86. (II, A)

DOMESTIC UTENSILS,* gourds, strainers, chocolate cup, etc., from Mexico.
COMMISSIONER OF MEXICO. 17070. '86. (II, A)

PHOTOGRAPHIC VIEWS of some important tunnels now under progress in America, and of the Ingersoll rock-drill machines used in connection therewith.
INGERSOLL ROCK DRILL COMPANY, Park Place, New York. 17071. '86. (XVIII)

BIRD SKINS. *Harporhynchus crissalis, Sylvania pileolata, Junco hyemalis, Chondestes sandwichensis, Otocoris strigata, Dryobates pubescens, Colaptes rufipileus*, hitherto undescribed and unknown male; *Lobipes hyperboreus*.
L. BELDING, Gridley, Butte County, California. 17072. '86. (V, A)

CRAB-PARASITES from skates, goose-fish mouth, haddock, and cod; worms from the stomach of goose-fish, sea-raven, sand shark, and haddock; also sea fleas.
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17073. '86. (XI)

FISHES. *Liostomus, Cyclopterus, Pleuronectes, Limanda, Brevoortia, Stolephorus, Monacanthus, Cottus, Salvelinus, Decapturus*, and egg of *Raia*.
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17073. '86. (VII)

MINERAL, for examination.
SAMUEL SCOTT, Rapid City, Dakota Territory. 17074. '86. (XVI)

FOSSIL SHELLS, from the Tertiaries of Florida and Mississippi, including *Baculites ovatus* Say, and *Belemnitella paxillosa* Lam.
A. G. WETHERBY, St. Andrew's Bay, Florida. 17075. '86. (IX)

WOOLEN AND COTTON YARNS,† from Russia.
17076. '86. (I)

SURGICAL APPLIANCES,† cotton lint, bandages, etc., used in the hospitals of Germany.
17076. '86. (I)

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* Received from the New Orleans Exposition.

† Received from New Orleans Exposition through Department of State.

EXOTIC LEPIDOPTERA (95 species, 218 specimens), from Europe.
JOHN B. SMITH, U. S. National Museum. 17077. '86. (x)

EXOTIC BUTTERFLIES (31 species, 43 specimens), from Africa and India.
B. NEUMŒGEN, New York, New York. 17078. '86. (x)

CALCITE, for examination.
H. M. HOCKMAN, Slanesville, West Virginia. 17079. '86. (XVIII)

AXOLOTL.
CHARLES RUBY, U. S. Army, Fort D. A. Russell, Wyoming Territory. 17080. '86. (VI)

MEMBRANOUS SACS of tumors taken from a large jack-rabbit, with granules from the same.
CHARLES RUBY, U. S. Army, Fort D. A. Russell, Wyoming Territory. 17080. '86. (IV)

DECOMPOSED ROCK, consisting of chloritic slate and quartz.
GEORGE W. BELL, Brentsville, Virginia. 17081. '86. (XVIII)

MOLLUSKS, an interesting collection from Madagascar.
EDWARD BARTLETT, Chillington House, Maidstone, Kent, England. 17082. '86. (IX)

ORE.
H. C. MORAN, Brightwood, District of Columbia. 17083. '86. (XVIII)

FOSSIL CORAL, *Zaphrentes* sp., and two pieces of trilobite, *Dalmanites* sp.
ARCHIBALD LIVERSIDGE, Sydney, New South Wales. 17084. '86. (XVII)

FOSSIL PLANT, *Gleichenia odontopteroides*, from Riddington.
ARCHIBALD LIVERSIDGE, Sydney, New South Wales. 17084. '86. (XIII, B)

COPPER, cobalt, copper pyrites, auriferous pyrites, chrome iron ore, and titaniferous iron (27 specimens).
ARCHIBALD LIVERSIDGE, Sydney, New South Wales. 17084. '86. (XVIII)

MINERALS (64 specimens).
ARCHIBALD LIVERSIDGE, Sydney, New South Wales. 17084. '86. (XVI)

MANGANESE ORE, from Nova Scotia.
JOHN S. LAMSON & BRO., Maiden Lane, New York City. 17085. '86. (XVIII)

BLACK SLATE, containing veins of calcite and pyrite, for examination.
C. S. WHITE, Romney, West Virginia. 17086. '86. (XVIII)

COKE (7 specimens).
H. SIMON, Manchester, England. 17087. '86. (XVIII)

BROOK-TROUT EGGS, for examination.
JOHN GAY, Commissioner of Fisheries, Greensburgh, Pennsylvania. 17088. '86. (XXI)

MINERALS (3 specimens).
JOHN H. HORNUNG, Oasis, Utah. 17089. '86. (XVI)

SQUIRREL, *Sciurus aureigaster*, a Central American species.
ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania. (Through Arthur Edwin Brown, esq.) '86. 17090. (IV)

BIRD SKINS (41 specimens), from Pernambuco, Brazil.
Dr. P. L. SCLATER, Zoological Society of London. 17091. '86. (V, A)

SHELLS (28 species), from the Bahamas.
CHARLES W. JOHNSON, Saint Augustine, Florida. 17092. '86. (IX)

MINERALS, from French localities (44 specimens). (Exchange.)
ÉCOLE DES MINES, Paris, France. 17093. '86. (XVI)

LOOM WEIGHTS (2), ancient Roman, from Haute-Savoie, France. (Exchange.)
M. L. CHARPY, Musee Annecy, Haute-Savoie, France. 17094. '86. (II, A)

ARCHÆOLOGICAL OBJECTS, one stone crusher (Lacrustrine), from Concise, L. Neufchatel, one celt (Lacrustrine), from Auverier, L. Neufchatel, Switzerland.
M. L. CHARPY, Museé Annecy, Haute-Savoie, France. (Exchange.) 17094. '86. (III)

SHELLS, from France (50 specimens).
M. L. CHARPY, Musée Annecy, Haute-Savoie, France. (Exchange.) 17094. '86. (IX)

INVERTEBRATE FOSSILS, Jurassic and Lower Cretaceous, about 70 species (200 specimens).
M. L. CHARPY, Musée Annecy, Haute-Savoie, France. (Exchange.) 17094. '86. (XIII, B)

FOSSIL PLANTS (2 specimens).
M. L. CHARPY, Musée Annecy, Haute-Savoie, France. (Exchange.) 17094. '86. (XIV)

ROCKS (154 specimens), from France, Italy, Belgium, and Hungary.
M. L. CHARPY, Musée Annecy, Haute-Savoie, France. (Exchange.) 17094. '86. (XVII)

MINERALS (84 specimens).
M. L. CHARPY, Musée Annecy, Haute-Savoie, France. (Exchange.) 17094. '86. (XVI)

FISH, 9-spined Stickle-back, *Gasterosteus pungitius* L.
WILLIAM HERRICK, Swan's Island, Maine. 17095. '86. (VII)

COMMON STICKLE-BACK, *Apeltes quadracus*, with four dorsal spines instead of three.
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17096. '86. (VII)

ROCKS, from New York, Massachusetts, and Bermuda.
Prof. WILLIAM NORTH RICE, Middletown, Connecticut. 17097. '86. (XVII)

BLACK MACAQUE MONKEY, *Cynopithecus niger*, in the flesh.
ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania (through Arthur Edwin Brown, Esq.). 17098. '86. (IV)

PARROT, *Palæornis eupatria*, in the flesh.
ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania (through Arthur Edwin Brown, Esq.). 17098. '86. (V, A)

BLUE BIRD, *Sialia sialis*, the blue color being of the same shade as in *S. arctica*.
ALLAN H. JENNINGS, Baltimore, Maryland. 17099. '86. (V, A)

RED-WINGED BLACKBIRD, *Agelaius phœniceus*, in the flesh.
SQUIRE MYERS, Baltimore, Maryland. 17100. '86. (V, A)

COATIMUNDI, *Nasua narica*.
SQUIRE MYERS, Baltimore Family Museum, Baltimore, Maryland. 17100. '86. (IV)

COTTON-TAIL RABBIT, *Lepus sylvaticus*.
HOWARD EATON, Medora, Dakota Territory. 17101. '86. (IV)

AMERICAN GOLDFINCH, *Spinus tristis*, in the flesh.
BURDETT HASSETT, Howard Center, Iowa. 17102. '86. (V, A)

MICA SCHIST, for report.
J. A. CONBOIE, Virginia City, Nevada. 17103. '86. (XVI)

RED-TAILED HAWK, *Buteo borealis*.
JOHN K. WALKER, Parkersburgh, Illinois. 17104. '86. (V, A)

SILICIFIED SHELLS, probably from a tertiary deposit; from Tampa Bay, Florida.
JAMES SHEPARD, New Britain, Connecticut. 17105. '86. (IX)

NEPHRITE. Seven specimens. (Exchange.)
CANTERBURY MUSEUM, Christ Church, New Zealand. 17106. '86. (XVI)

FERRUGINOUS LIMESTONE, for report.
RICHARD BENNETT, Eureka Springs, Arkansas. 17107. '86. (XVIII)

MINERALS.
CHARLES BALBACH, Hot Springs, Arkansas. 17108. '86. (XVI)

ALTERED MAGNETIC IRON and impure sulphate of iron; for report.
D. C. GUERNSEY, Dayton, Washington Territory. 17109. '86. (XVI)

BIRD-SKINS, three species of Junco (7 specimens).
Dr. R. W. SHUFELDT, U. S. A., Fort Wingate, New Mexico. 17110. '86. (V, A)

ETHNOLOGICAL OBJECTS, brooms, blankets, baskets, carrying nets, etc., from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (II, A)

FOODS, from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (I)

FIBERS, from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (I)

DYE-STUFFS, from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '869. (I)

SILVER ORE, from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (XVIII)

PLANTS, from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (XV)

POTTERY, from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (II, B)

FISH-TRAP, from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (I)

MATERIA MEDICA. A very interesting collection of Indian medicines from Mexico.
Dr. EDWARD PALMER, U. S. National Museum. 17111. '86. (I)

BIRDS' EGGS. Abert's Towhee, *Pilo aberti*, and Rufous-vented Thrasher, *Harporhynchus crissalis*; for examination.
ROSWELL S. WHEELER, Jr., Pima Indian Agency, Arizona. 17112. '86. (V, B)

RAILROAD SPIKES (32).
PENNSYLVANIA RAILROAD COMPANY, Camden, New Jersey. (Through J. E. Watkins.) 17113. '86. (I)

SHELL, *Unio gibbosus*, from the Neosho River, Kansas, for examination.
Dr. W. S. NEWLON, Oswego, Kansas. 17114. '86. (IX)

OPTICAL DENSIMETER, No. 4, and one case of salinometers.
U. S. COAST SURVEY, Washington, District of Columbia. 17115. '86. (I)

IRON PYRITES in schistose rock, for examination.
J. M. LINEBERGER, Lowell, North Carolina. 17116. '86. (XVIII)

MIXTURE of magnetite, oxide of iron, and quartz, for examination.
M. L. MAYNARD, Dayton, Washington Territory. 17117. '86. (XVIII)

BROOK TROUT, *Salvelinus fontinalis*, Rock eel, *Muræenoides gunnellus*, with skin parasites. Also a part of lower caudal lobe of a shark (?) or some other selachian (?).
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17118. '86. (VII)

FISH PARASITES and copepods.*
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17118. '86. (XI)

IRON PYRITES in black quartz, for examination.
WILLIAM F. MCCAIN, Lincoln, Alabama. 17119. '86. (XVIII)

BROWN-HEADED NUTHATCH, *Sitta pusilla*, Lat. (skin), for examination.
G. NOBLE, Savannah, Georgia. 17120. '86. (V, A)

INDIAN SADDLE.
CHARLES RUBY, U. S. A., Fort D. A. Russell, Wyoming Territory. 17121. '86. (II, A)

PYROPHYLLITE, from Glen's Mills, Deep River, North Carolina.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through I. C. Russell.) 17122. '86. (XVI)

ELAND, *Oreas canna*, specimen in the flesh, from Africa.
LEWIS SELLS, Columbus, Ohio. 17123. '86. (IV)

BIRD-SKINS, *Passerella iliaca unalascensis* (4 specimens) and *Melospiza fasciata samuelis* (6 specimens), skins, from Alameda County, California.
W. OTTO EMERSON, Haywards, California. 17124. '86. (V, A)

BIRD-SKINS, *Spinus psaltria*, *Calcarius ornatus*, *Amphispiza bilineata*, *Melospiza lincolni*, *M. montana*, *Poocætes confinis*, *Otocoris arenicola*, *Sayornis fuscus*, and *S. sayi*.
WILLIAM LLOYD, Toyah, Texas. 17125. '86. (V, A)

BIRD SKELETONS, *Picus gairdneri*, *Carpodacus cassini*, *Pica hudsonica*, *Picus harrisi*, *Melospiza montana*, *Junco oregonus*, and *J. annectens*.
A. W. ANTHONY, Denver, Colorado. 17126. '86. (XII)

EGG of the Black-billed Magpie, *Pica rustica hudsonica*.
A. W. ANTHONY, Denver, Colorado. 17126. '86. (V, B)

LIGNITE, or brown coal, for report.
S. D. LONGHEED, New Dungeness, Clallam County, Washington Territory. 17127. '86. (XVIII)

MICROSCOPIC SLIDE, showing a scale of a common herring, *Clupea* sp.
Rev. J. L. ZABRISKIE, Nyack, New York. 17128 '86. (VII)

GALENA, and impure hematite.
D. S. LOY, Mechanicstown, Maryland. 17129. '86. (XVIII)

PYRITES.
HENRY C. MOYER, Hilltown, Pennsylvania. 17130. '86. (XVIII)

EUROPEAN WHITE PELICAN, *Pelecanus oncocrotalus* Linn. (skeleton).
CENTRAL PARK MENAGERIE (through W. A. Conklin, Esq., New York City, New York). 17131. '86. (XII)

INVERTEBRATE FOSSILS, Lower Cambrian.
Duplicates from the collections of original investigations of the St. John group.
CORNELL UNIVERSITY, Ithaca, New York. (Through H. S. Williams.) 17132. '86. (XIII, A)

HERCULES BEETLE, *Dynastes tityus*.
J. W. WAKEMAN, Waterlick, Warren County, Virginia. 17133. '86. (X)

REPTILES, *Coluber obsoletus*, juv., *Ophcosaurus ventralis*, *Eumeces* sp., *Sceloporus* sp., and *Rana* sp. (10 specimens).
G. H. RAGSDALE, Gainesville, Cook County, Texas. 17134. '86. (VI)

BIRD-SKINS, *Parus carolinensis*, *Chondestes strigatus*, *Otocoris arenicola*, *Poocætes gramineus*, *Ictinia mississippiensis*, *Buteo harlani*, and *Syrnium alleni* (the first specimen of this form taken outside of Florida, 11 specimens).
G. H. RAGSDALE, Gainesville, Cook County, Texas. 17134. '86. (V, A)

CAST of a double-bladed ceremonial axe of coarse-grained syenite, found at Hudson City, Hudson County, New Jersey, 7 feet below the surface.
Dr. J. B. HOLDER, Am. Mus. of Nat. History, New York. 17135. '86. (III)

CABINET PHOTOGRAPH of Bolivar statue in New York, and the following coins:
Ten centavos of Peru (no date); 1 centavo of Argentine Republic, 1884; 2 centavos of Argentine Republic, 1884; 100 reis of Brazil, 1883; 20 reis of Brazil, 1869; 40 reis of Brazil, 1875; 40 reis of Brazil (date illegible); 1 centavo of Mexico, 1878; 1 centavo of Mexico (in halves); half dos-centavos of Mexico; 2 centimes of France, 1877; 5 centimes of France, 1882; half cent of the United States, 1854; 1 cent of Nova Scotia, 1861.

NATHAN APPLETON, Boston, Massachusetts. 17136. '86. (I)

COINS, from Italy, Grand Duchy of Luxemburg, Great Britain, France, and the Turkish Empire (11 specimens). Deposited.
FRANK A. REYNOLDS, U. S. National Museum. 17137. '86. (I)

NATURAL COKE, from Midlothian, Virginia.
U. S. GEOLOGICAL SURVEY. (Through I. C. Russell.) 17138. '86. (XVIII)

INSECTS (over 1,000 species and several thousand specimens of Coleoptera, Lepidoptera and Hemiptera).
Prof. FERRARI-PEREZ, Mexican Geographical Exploring Commission, Puebla, Mexico. 17139. '86. (X)

TROUT, *Salvelinus namaycush*, from Wytheville, Virginia.
U. S. FISH COMMISSION, Washington, District of Columbia. 17140. '86. (VII)

SHARK, *Isurus dekayi*, about seven feet long.
SILAS STEARNS, Pensacola, Florida. 17141. '86. (VII)

AOUDAD, *Ovis tragelaphus*, in the flesh, from Africa.
FLETCHER M. NOE, Indianapolis, Indiana. 17142. '86. (IV)

INVERTEBRATE FOSSIL, *Baculites ovatus*, from Black Hills, Dakota; for examination.
J. H. LOCKE, North Charlestown, New Hampshire. 17143. '86. (XII, B)

INSECTS, 29 species of Lepidoptera; for examination.
HOWARD L. CLARK, Providence, Rhode Island. 17144. '86. (X)

MINERALS (21 specimens).
W. C. JIRDONSTON, Ashe County, North Carolina. 17145. '86. (XVI)

CARBONIFEROUS FOSSIL, *Allorisma subcuneata* (a rotted specimen).
W. C. JIRDONSTON, Ashe County, North Carolina. 17145. '86. (XI, A)

STONE PIPE.
W. C. JIRDONSTON, Ashe County, North Carolina. 17145. '86. (III)

MARINE SHELLS (25 specimens), from Alaska; also *Helix fidelis* Gray, from Humboldt Bay, California.
C. H. TOWNSEND, U. S. Fish Commission. 17146. '86. (IX)

MAMMAL SKINS and skulls, *Rangifer tarandus*, *Tamias townsendi*, and *Eumetopias stelleri*, from California.
C. H. TOWNSEND, U. S. Fish Commission. 17146. '86. (IV)

FISHES, *Limanda aspera*, *Pleuronectes stellatus*, *Podothecus acipenser*, *Tilesia navaga*, *Gymnacanthus galeatus*, *Cottus humilis*, *Esox lucius*, *Thymallus signifer*, *Coregonus quadrilateralis*, *C. merkii var*, *C. kennicotti*, *C. Nelsoni*, *Stenodus mackenzii*, *Salvelinus namaycush*, *S. malma*, *Oncorhynchus gorbuscha*, *Catostomus longirostris*, from Alaska.
C. H. TOWNSEND, U. S. Fish Commission. 17146. '86. (VII)

ATLANTIC WALRUS, *Odobœnus rosmarus* (portion of the skull and tibia), and also the fourth and fifth right metacarpals and fourth proximal phalanx, with a portion of mandible, of Polar bear, *Thalarctos maritimus*.
Lieut. A. W. GREELY, U. S. Army, Chief Signal Officer. 17147. '86. (XIV)

CALCITE and gypsum, from California.
JOHN LANG, Lang, Los Angeles County, California. 17148. '86. (XVI)

LOUISIANA HERON, *Ardea tricolor ruficollis*. (Exchange.)

Dr. B. H. WARREN, West Chester, Pennsylvania. 17149. '86. (V, A)

SKULL AND BONES of *Putorius eversmanni*, from Lower Volga; a "street dog" from Jaffa; skeleton of German Dachshund, apparently thoroughbred, from Berlin. (Exchange.)

Prof. Dr. A. NEHRING, Berlin, Germany. 17150. '86. (IV)

MINERALS. (13 specimens.)

Prof. H. CARMICHAEL, Brunswick, Maine. 17151. '86. (XVI)

SODALITE in elæolite-syenite, from Litchfield, Maine.

H. K. MORRELL, Gardiner, Maine. 17152. '86. (XVI)

INVERTEBRATE FOSSILS. (Exchange.)

GEORGE F. MATTHEWS, St. John, New Brunswick. 17153. '86. (XIII, A)

MINERALS. (Exchange.)

JAMES MATTERS, Saint Peter's, Chester County, Pennsylvania. 17154. '86. (XVI)

MICROSCOPIC SLIDE, showing a scale of a white perch, *Roccus americanus* Gm.

Rev. J. L. ZABRISKIE, Nyack, New York. 17155. '86. (XXI)

BAT, *Atalapha cinerea*.

G. NOBLE, Savannah, Georgia. 17156. '86. (IV)

INDIAN ARROW-POINTS, made of obsidian.

A. F. DAVIDSON, Croston, Marion County, Oregon. 17157. '86. (III)

LEAD AND SILVER ORE.

GUYMARD SILVER LEAD COMPANY, Guymard, Orange County, New Jersey. 17158. '86. (XVIII)

MINERALS, with washed gravel, from the diamond fields of Africa.

GEORGE D. STONESTREET, Birmingham, Alabama. 17159. '86. (XVI)

BIRD-SKINS (24), including a fine series of *Leucosticte australis* and *L. tephrocotis*.

DENIS GALE, Gold Hill, Colorado. 17160. '86. (V, A)

INSECT, *Perla*, sp.

DENIS GALE, Gold Hill, Colorado. 17160. '86. (X)

BIRDS'-NESTS AND EGGS.

DENIS GALE, Gold Hill, Colorado. 17160. '86. (V, B)

HISTORICAL RELICS: One indenture of H. R. Schoolcraft and Francis Picquette, March 18, 1833; appointment of H. R. Schoolcraft as captain in the Michigan milita by Lewis Cass, Governor of Michigan, dated June 30, 1833; fashion plate, spring and summer 1851, published by F. Mahan, with portraits of Henry Clay, M. Fillmore, J. C. Calhoun, M. A. Root, Jenny Lind, and P. T. Barnum. (Deposited.)

WILLIAM J. RHEES, Smithsonian Institution. 17161. '86. (I)

HOG DEER, *Cervus porcinus*, in the flesh.

CENTRAL PARK MENAGERIE (through W. A. Conklin, Esq., New York City). 17162. '68. (IV)

HISTORICAL RELICS: Fac-similie of General Washington's account of expenses during the Revolutionary War; also fac-similie of a communication to General Forbes proposing a plan of battle for the expedition against Fort Duquesne (now Pittsburgh), in 1758. (Deposited.)

WM. J. GREEN, U. S. National Museum. 17163. '86. (I)

SAND SHARK, *Carcharias littoralis*, Mitch., from Fortress Monroe, Virginia.

D. W. GRINDER, Washington, District of Columbia. 17164. '86. (VII)

JAMAICA FISHES, 35 species (82 specimens).

PUBLIC MUSEUM OF JAMAICA, Institute of Jamaica, Kingston, Jamaica. 17165. '86. (XII)

CERITE, from Bastnäs, near Riddarhyttan, Westmannland, Sweden.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia (through F. W Clarke). 17166. '86. (XVI)

COMMISSION of Isaac Chauncey as lieutenant in U. S. Navy, signed by John Adams, President of the United States, June 11, 1799, parchment. (Deposited.)
WM. J. GREEN, U. S. National Museum. 17167. '86. (I)

METEORITE (2 fragments), from Jenny's Creek.
G. M. CRABTREE, Lick Ridge, Wayne County, West Virginia. 17168. '86. (XVI)

GLACIATED ROCK SURFACE.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17169. '86. (XVII)

SHELLS.
W. O. EMERSON, Haywards, California. 17170. '86. (IX)

HARPY EAGLE, *Thrasætus harpyia*, in the flesh.
W. A. CONKLIN, New York City. 17171. '86. (V, A)

FIBROUS CALCITE, from the Tombigbee River, Alabama.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17172. '86. (XVI)

FISHES. *Hemirhombus æthalion* (type), *Citarichthys spilopterus* and *Aphoristia plagiusa*, from Havana, Cuba. Also *Chatodon aya*, from Pensacola, Florida.
Prof. D. S. JORDAN, Bloomington, Indiana. 17173. '86. (VII)

CARRYING BASKET, from Cozumel Island, and a water vessel from old Providence Island.
JAMES E. BENEDICT, U. S. Fish Commission. 17174. '86. (II, A)

MUSKET BALL, furnished to the Savannah Fencibles during the war of 1812, by Captain James Hunter.
C. J. WADE, Washington, District of Columbia. 17175. '86. (I)

DIPTERA, Hemiptera, and Hymenoptera, from Jamaica, and Pennsylvania.
F. W. KLAGES, Pittsburgh, Pennsylvania. 17176. '86. (X)

YELLOW-FIN GROUPER, *Epinephelus flavolimbatus* Poey.*
SILAS STEARNS, Pensacola, Florida. 17177. '86. (VII)

FRAGMENT of the mosaic pavement at Tiberius Place, Palentine Hill, Rome.
GEORGE H. BOEHMER, Smithsonian Institution. 17178. '86. (I)

"AGOUTI," *Desyprocta isthmica*, in the flesh, from Central America.
Admiral J. E. JOUETT, U. S. N. (Through C. W. Beckham, U. S. N.) 17179. '86. (IV)

MILITARY PASS issued to Wm. Cooper, August, 1861, to pass over the bridges and within the lines of the Army of the Potomac, General Mansfield, commanding. (Deposited.)
WM. B. COOPER, U. S. National Museum. 17180. '86. (I)

MILITARY COMMISSIONS issued to Isaac Chauncey. Also commissions to Wolcot Chauncey. (Deposited.)
Mrs. EDWIN GREEN, Washington, District of Columbia. 17181. '86. (I)

CHIASTOLITE, from Rochester, New Hampshire.
JOHN I. LEGRO, New Britain, Connecticut. 17182. '86. (XVI)

ROCK, exhibiting markings probably caused by glacial action.
A. L. BRACE, Amazonia, Missouri. 17183. '86. (XVII)

BIRD SKINS (17 specimens), from Texas. (Exchange.)
T. MCILWRAITH, Hamilton, Ontario, Canada. 17184. '86. (V, A)

NORTH EUROPEAN NUT-HATCH, *Sitta europæa*, from Norway.
Dr. L. STEJNEGER. U. S. National Museum. 17185. '86. (V, A)

LOGGERHEAD SHRIKE, *Lanius ludovicianus*.

JESSE J. TURNER, Mount Carmel, Illinois. 17186. '86. (V, A)

ROCKS, from Germany, France, Italy, Switzerland, New York, Minnesota, and Maryland. (Exchange.)

Dr. G. H. WILLIAMS, Baltimore, Maryland. 17187. '86. (XVII)

SPINNING-WHEEL and distaff, from Wurtemberg, Germany.

Mrs. L. S. WEAVER, Smithsonian Institution. 17188. '86. (I, B)

CRYSTALLIZED CALCITE, from Matanzas, Cuba. (Exchange.)

WARD AND HOWELL, Rochester, New York. 17189. '86. (XVII)

MARBLE, twelve cubes, six thin slabs, and one small column, from Tate, Pickens County, Georgia.

GEORGIA MARBLE COMPANY, Atlanta, Georgia. 17190. '86. (XVII)

PHOTOGRAPH of three large flint implements.

EDWARD D. HICKS, Nashville, Tennessee. 17191. '86. (III)

ROCKS, from Kentucky and California.

U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through J. S. Diller.) 17192. '86. (XVII)

BRASS MODEL of a screw propeller, designed by and made under the direction of Isaac Dripps, at Bordentown, N. J., in 1840, for the iron steam tug *New Jersey*, which was built in England by Capt. John Ericsson, and came to America under sail schooner-rigged in 1839, commanded by Captain Crane, and was the first iron boat to cross the Atlantic. Also a photograph showing original propelling and steering devices.

ISAAC DRIPPS, Philadelphia, Pennsylvania. 17193. '86. (I)

BARB of Sting Ray, *Trygon dipterurus*, taken from a specimen in San Diego Bay, California.

W. TRACY EUSTIS, Boston, Massachusetts. 17194. '84. (VII)

TOILET BOX made of wood, decorated with minerals principally from Colorado.

Mrs. G. BROWN GOODE, Washington, District of Columbia. 17195. '86. (XVI)

ALBINO DEER-SKIN.

R. MACFARLANE, Fort Chippewyan, Hudson Bay Territory. 17196. '86. (I)

VARANUS, *Varanus bengalensis*, from northern India.

ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania. (Through Arthur Edwin Brown, Esq.) 17197. '86. (XII)

OPIUM SMOKING OUTFIT, including pipes and other apparatus used by the Chinese. (Deposited.)

POLICE DEPARTMENT OF NEW YORK CITY. (Through Hon. Fitz John Porter.) 17198. '86. (II, A)

MATERIA MEDICA (27 specimens).

FREDERICK STEARNS & CO., Detroit, Michigan. 17199. '86. (I)

PLANTS. A very valuable collection of Mexican plants, containing over 400 species, many of which are new to the Museum collection.

C. G. PRINGLE, Charlotte, Vermont. 17200. '86. (XV)

BIRD NESTS AND EGGS (3 species, 641 specimens). (Exchange.)

Capt. B. F. Goss, Pewaukee, Wisconsin. (Through Capt. Charles E. Bendire.) 17201. '86. (V, B)

AMERICAN EGRET, *Ardea egretta*, Gmel. (skin), from near Fort Klamath, Oregon.

Collected by Dr. SAMUEL Q. ROBINSON, U. S. Army. 17202. '86. (V, A)

MOLLUSKS, *Bythinella stenothyroides*, Dohrn, from Ceylon.

W. G. MAZYCK, Charleston, South Carolina. (Through W. H. Dall.) 17203. '86. (IX)

"VADJRA," the diamond club; from Japan.
Dr. D. BETHUNE MCCARTEE, Washington, District of Columbia. 17204. '86. (II, A)

CHIMNEY SWIFTS, *Chætura pelagica* (2 specimens).
U. S. FISH COMMISSION, Wood's Holl, Massachusetts. 17205. '86. (V, A)

INVERTEBRATE CRETACEOUS FOSSILS, from Sonora and Puebla, Mexico.
Señor AGUILERO, Mexican Geographical Exploring Commission, Mexico. 17206. '86. (XIII, B)

MATERIA MEDICA, and chemical preparations.
Dr. THEO. SCHUCHARDT, Goerlitz, Germany. 17207. '86. (I)

CALCITE, and calcite crystals with bituminous coal.
R. ELLSWORTH CALL, Moline, Illinois. 17208. '86. (XVI)

LAND AND FRESH-WATER MOLLUSKS, from Manitoba.
ROBERT MILLER CHRISTY, Chignal, St. James, England. 17209. '86. (IX)

TROUT, *Salmo irideus* (3 specimens).
WM. MONTGOMERY, Verona, Missouri (through U. S. Fish Commission). 17210. '86. (VII)

BREAST-PIN, made of banded and moss agate, mounted with blood stones in silver.
Messrs. HARRIS AND SCHAFER, Washington, District of Columbia. 17211. '86. (XVI)

EGGS of *Archibuteo ferrugineus*, from northern Dakota.
Capt. B. F. GOSS, Pewaukee, Wisconsin. 17212. '86. (V, B)

LARVA of grasshopper, *Hippiscus discoideus*, or *H. phœnicopterus*.
G. D. BELT, Missoula, Montana. 17213. '86. (X)

MANNIKIN of an Arab; prepared in Paris under the supervision of the director of the Trocadéro Musée.
JULES HEBERT, 9 rue Henri Martin, Paris, France. 17214. '86. (II, A)

OPIUM-SMOKING OUTFIT, including pipes and other apparatus used by the Chinese. This outfit has been in use and was confiscated by the police in San Francisco.
P. CROWLEY, Chief of police, San Francisco, California. 17215. '86. (II, A)

PICTURE of a sunset cloud, viewed from Taylor's Hill, Columbia, South Carolina.
G. T. BERG, Columbia, South Carolina. 17216. '86. (XVII)

SHELL, *Unio anodontoides*.
Dr. W. S. NEWLON, Oswego, Kansas. 17217. '86. (I)

COTTON, raised by slave labor on the estate of the late J. Harvey Williamson, in Bethesda Township, South Carolina, in 1862. This cotton was packed before iron ties came into use, and when no roping was to be had. Hickory withes were used, and these are still in a state of good preservation. This is probably the oldest cotton in the world, and is certainly the only sample extant which was raised in the manner peculiar to the hard times of the late war.
W. L. RODDEY AND CO., Rock Hill, South Carolina. 17218. '86. (I)

METEORIC IRON (37 grammes), from Glorieta Mountain, New Mexico. (Exchange.)
GEORGE F. KUNZ, New York City. 17219. '86. (XVI)

WALL ACCRETION.
COLORADO SMELTING COMPANY, South Pueblo, Colorado. (Through O. H. Hahn.) 17220. '86. (XVIII)

DIURNAL LEPIDOPTERA, a collection comprising many of the rarer American and European Coleoptera.
JOHN B. SMITH, U. S. National Museum. 17221. '86. (X)

REPTILES from Fort Custer, Montana.
Capt. CHARLES E. BENDIRE, U. S. A., U. S. National Museum. 17222. '86. (VI)

FISHES, *Lota maculosa, Hyodon alosoides, Uranidea semiscabra, Noturus exilis*, and *Hybognathus placitus;* from Fort Custer, Montana.

Capt. CHARLES E. BENDIRE, U. S. A., U. S. National Museum. 17222. '86. (VII)

BIRD-SKINS, 67 species (95 specimens), from various localities, mostly from Australia. (Exchange.)

EDWARD BARTLETT, Chillington House, Maidstone, Kent, England. 17223. '86. (V, A)

IRON METEORITE CHIPPING, from Scriba, New York; iron meteorite, from Brannau, Bohemia; stone meteorite fragment, from L'Aigle, France. (Exchange.)

S. C. H. BAILEY, Cortland-on-Hudson, New York. 17224. '86. (XI)

PERFORATED ANTIQUE GARNETS (10), found in a Bohemian grave.

GEORGE F. KUNZ, Hoboken, New Jersey. 17225. '86. (XVI)

CATLINITE (3 specimens) and quartz (1 specimen) from Minnesota.

N. H. WINCHELL, Minneapolis, Minnesota. 17226. '86. (XVII)

COINS, bronze, brass, and copper, of Great Britain and the United States. Also a decorated earthenware platter made at Coburn, England.

T. W. SWEENY, U. S. National Museum. 17227. '85. (I)

WASHINGTON AND INDEPENDENCE TOKEN of 1783 (2 impressions).

S. A. WALKER, New York City. 17228. '86. (I)

BRONZE COINS: One pfennig, of Germany, 1875, and two stotinki of Bulgaria.

W. C. GOLDIN, Washington, District of Columbia. 17229. '86. (I)

DEVONIAN FOSSILS.

C. L. WEBSTER, Iowa City, Iowa. 17230. '86. (XIII A)

COMMON WHITEFISH, *Coregonus clupeiformis*, and mongrel whitefish, *C. tullibee.*

FRANK N. CLARK, Northville, Michigan. 17231. '86. (XII)

PREHENSILE-TAILED MONKEY, *Cebus hypoleucus.*

BARTON AND LOGAN DIME MUSEUM, Washington, District of Columbia. 17232. '86. (IV)

BIRD-EGGS, 9 species (105 specimens).

Capt. B. F. GOSS, Pewaukee, Wisconsin. 17233. '86. (V, B)

SEA-WAIFS, seeds and fruits, washed ashore at the Palisadoes plantations, Jamaica. No. 1. Spondias; unknown in Jamaica. No. 2. Unknown at Kew; probably a palm. No. 3. Astrocaryam; unknown in Jamaica. No. 5. *Calophyllum calaba;* native timber tree. No. 6. *Mucuna urens;* common to the islands. No. 8. *Cæsalpinia Bonducella;* a common sea-shore plant. No. 9. *C. Bonduc;* a common sea-shore plant. No. 10. *Canavalia obtusifolia;* common near the sea. No. 11. *Ipomea pes-capræ;* common near the sea. No. 12. *Ecastophyllum;* unknown in Jamaica. No. 13. *Entada scandens;* a river-side plant common from sea-level to 2,000 feet; vines sometimes 600 feet long. No. 15. *Ecastophyllum Brownei;* Jamaica sea-coast. No. 16. *Manicaria saccifera;* ("sea cocoanut"); seeds of a palm; native of the mainland and Trinidad, not native of Jamaica. The fact of seeds being washed ashore here was noticed by Sloane. No. 18. *Omphalea diandra;* mainland?

Determinations by J. R. Jackson, Esq., Royal Gardens, Kew, England.

D. MORRIS, Director Public Gardens and Plantation, Jamaica. 17234. '86. (XVII)

ALBINO HOUSE MOUSE, *Mus musculus*, from Concordia Parish, Louisiana.

W. C. PERCY, Jr., Black Hawk, Louisiana. 17235. '86. (IV)

HAIR WORMS, *Gordius*, sp., for examination.

Dr. J. B. SMITH, Little Rock, Arkansas. 17236. '86. (XI)

SAMPLES OF EARTH, black sand, and gold dust.

ALLEN D. WOLCOTT, Randolph, Coos County, Oregon. 17237. '86. (XVIII)

PHOTOGRAPH of banded hypersthene andesite, from Conwakiton Cañon, California.

U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through J. S. Diller.) 17238. '86. (XVII)

FOSSILS, type specimens, described by Prof. J. M. Clarke, in Bulletin No. 16, from the Devonian system in New York State. *Aulopora annectens*. Clarke (1); *Lingula triqueta*, Clarke (1); *Chonetes lepida*, Hall (1); *Spirifer Balphegor*, Clarke (1); *Spirifer Pluto*, Clarke (16); *Leiorhynchus Hecate*, Clarke (13); *Modiomorpha Chemos*, Clarke (1); *Loxonema Noe*, Clarke (1); *Platyostoma minutissima*, Clarke (6); *Bellerophon incisus*, Clarke (1); *Orthoceras aciculoides*, Clarke (1); *Macrocheilus Moloch*, Clarke (1); *Palæotrochus præcursor*, Clarke (1): *Orthoceras Asmodeus*, Clarke (1); *O. filosum*, Clarke (2); *O. Ontario*, Clarke (2); *O. Mephisto*, Clarke (1); *Goniatites Lutheri*, Clarke (1); *G. nodifer*, Clarke (2); *Hyolithes Neapolis*, Clarke (2); *Ceratiocaris Beccheri*, Clarke (1); *Eichinocaris Whitfieldi*, Clarke (2); *Beyrichia Dagon*, Clarke (1).

U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17238. '86. (XIII)

ETHNOLOGICAL OBJECTS collected among the Hoopa Natano and Klamath Kenuck Bands in northwest California.

No. 1. Stone war-knife, found in grave; obsolete.

Nos. 2–9. Stone knives; obsolete.

No. 10. Stone knife, complete. Found in grave.

Nos. 11–13. Horn chisels; a piece of elk antler ground to an edge; obsolete. Formerly used to hollow out canoes and other wood-work.

Nos. 14–17. Stone hammers; still in use by the old men, but none of them are able to make one.

No. 18. Hat of elk-skin, tanned and painted. Worn by young men at a dance which is given when they attain the age at which they are admitted to the councils of the bands (about twenty years).

No. 19. Hat or head dress, Indian money. A broad band of buck-skin embroidered with pieces of skin from the head of the woodpecker, and worn by men at festal dances. It is used as a medium of exchange, and in traffic is valued at about $30.

No. 20. Pillow; a wooden block used for a pillow; still frequently seen in use by the old people.

Nos. 21–22. Comb or head scraper; made of elk-bone or wood. Used to scrape vermin or dirt from the hair.

No. 23. Louse-crusher. A piece of bone from the leg of a deer used to crush vermin in the hair by placing it under the hair and pressing it with the bone comb or scraper (No. 21).

No. 24. Fire-drill; still in use among the old people. The drill is revolved between the palms of the hands.

No. 25. Pipe and case; in common use among the men.

Nos. 26–27. Stone pipes taken from graves; obsolete; very old.

No. 28. Pipe made of wood and stone; in common use.

No. 29. Money-box; made from a piece of deer antler. Used as a receptacle for *Dentalium* shells (Indian currency).

No. 30. A small basket used to winnow the chaff from the grain and grass seed by tossing it in the air.

Nos. 31–32. Hoppers; small, willow baskets with an aperture at the bottom, used in grinding acorns in connection with a smooth, flat stone 12 by 18 inches in diameter, which is placed in a large, shallow basket to catch the meal. A mill consists of one hopper, one pestle, one large, shallow basket, and a flat, smooth stone.

ETHNOLOGICAL OBJECTS, etc.—Continued.

Nos. 33–34. A willow basket, open work and shallow. Used to serve boiled salmon at feasts; still in common use.

No. 35. Hamper of open willow work; used by the women in carrying loads. It is supported by a band across the forehead.

No. 37. A large, shallow basket; used under the grinding-stone to catch the meal. (See Nos. 31–32.)

Nos. 41–46. Bows, arrows, and quivers, of the patterns now commonly in use. The bow and arrow is now used only in taking small game.

No. 47. A baton of basket work, carried by men in the right hand while dancing.

Nos. 48–49. Paint mills; obsolete; very old.

Nos. 50–52. Stone frying-pans; in common use.

No. 53. Wooden stool; in common use.

No. 54. Tobacco-pouch of basket-work.

No. 55. Otter-skin and shell ornaments. Worn by women in the hair when dancing.

No. 56. Woman's necklace.

No. 57. Rattle used in dancing; made of deer hoofs.

No. 58. Necklace of large pine nuts; worn by women.

No. 59. Necklace of small pine nuts; worn by women,

No. 60. Hair brush; made of elk hair and leather.

No. 61–63. Dance dresses, worn by women at dances and occasions of ceremony.

No. 64. Man's deer-skin cloak.

No. 65. Dip-net used in taking eels and young salmon. Made of grass-fiber twine. (See 78–80.)

No. 66. Stone spoon; obsolete.

No. 67–70. Stone baking dishes, in common use by the old people for baking a kind of pone made of acorn meal.

No. 71. Salmon spear-heads, used with a pole and line. The head detaches from the pole when the fish is struck, and it is retrieved with the line.

No. 72. Shell necklace; worn by women.

No. 73–74. Aprons for women; worn at dances; made of grasses braided over buckskin.

No. 75–76. Spoons in common use.

No. 77. Horn money-box with money (*Dentalium* shells).

No. 78. Seine twine of grass fiber. (See No. 80.)

No. 79. Grass fiber. Each blade of grass (No. 80) produces two strands of fiber. It is stripped when the grass is green by scraping with the thumb-nail, or a mussel-shell fastened on the thumb, and is twisted into a cord with the palm of the hand on the thigh.

No. 80. Grass from which fiber No. 79 is taken.

No. 81. Grass used in the manufacture of baskets. (See Nos. 88–93, 100–102.)

No. 82. Pad, to protect the forehead in carrying heavy loads.

No. 83. A talisman. A stone knife-blade with a wrapping of otter-skin. This particular kind of stone is held in great veneration, and is said to be brought from a long distance. It is not found in the vicinity of Hoopa, so far as is known.

No. 84. Ermine skin.

No. 85. Stone. The size used in cooking sow-heads—a kind of acorn mash. It is cooked in a basket (No. 106) by dropping the heated stones.

ETHNOLOGICAL OBJECTS, etc.—Continued.

No. 86. A girdle of woven grass; worn by women.

No. 87. Seine needle.

No. 88–93. Caps for women; woven of grass, (see No. 81), except the black, which is woven of the stems of the maiden-hair fern.

No. 94–97. Salmon dishes. (See No. 33–34.)

No. 98–99. Dishes for serving sow-how (acorn mash) at feasts.

No. 100–102. Fancy baskets.

No. 103. Mat of woven grass.

No. 104. Paddle; used to ceremoniously stir the dish of sow-how while cooking for a feast.

No. 106. Basket in which sow-how is cooked with heated stones.

No. 107. Common hunting bow.

No. 108. Large hamper for storing acorns, clothing, etc.

No. 109–110. Two marmot skins.

No. 111. Hand adze with stone handle, very old; formerly used in hollowing out log canoes and other wood-work; still retained in use by the old men.

No. 112–114. Pestles of stone; in common use. (See Nos. 31-32.)

No. 115. Hand-spear used in killing salmon in shallow water, in the rapids.

No. 116. Hair pins, obsolete; formerly worn by the men in the braid of hair at the back of the head, the point projecting to prevent the braid being grasped by an enemy. Chinese.

No. 117. Indian money. Skins of the woodpecker arranged to be worn at a dance; current value, $25 to $40 in trade.

No. 118. Basket for cooking sow-how. (See No. 106.)

No. 119. Panier in which infants are packed and carried.

No. 120. Elk-skin armor; native name "Cue-it-wul." Worn by warriors in battle as protection from arrows; now nearly obsolete. This suit has been worn by several generations, and has been worn in some of the modern battles with the whites. The cusks and triangular figures are intended to denote the number of enemies slain and captives taken. It is worn so as to cover the left side, with the left arm through the slot and the head through the opening and the tie on the right shoulder, and it is also tied below the right arm. The arrow-cuts and bullet marks were received in battle.

No. 121. Suit of armor. Wattles and twine woven and bound with buckskin; native name "Klnig-klicyst-e-cue-it-wul." Worn in battle to protect the body; it is tied across the breast from left to right; the red lines denote the number of enemies slain or captives taken, also the rank of the wearer. This class of armor was in common use among the Natano and Kenuck Indians before the introduction of fire-arms, but is now nearly obsolete. This is the only complete suit I have been able to obtain.

No. 122. Native name, "Mik-klikt-okt." Tool for chipping flint, used in making stone arrow-heads. The work is held in the palm of the hand, which is protected by a buckskin pad, and the chips are flaked off by pressing on the edge of the flint with this tool held in the right hand, the ball of the handle resting in the palm.

No. 123. Arrow straightener; native name, "Mitchi-nat-kea-kus." This tool is used to straighten arrow-shafts. The shaft is passed through the slot and the workman looks along it with his eye and nips it with the tool where it is crooked. They go over the arrows with the straightener several times while working them down with a knife, and they also carry a straightener to straighten their arrows that become warped in use.

No. 124. Gambling tools (sticks), Kenuck (Klamath); native name, "Kin-nah-e-lah." A bunch of small wands, one of which has a black band around the center. The game is played by any number that wish to engage in betting. It is played

ETHNOLOGICAL OBJECTS, etc.—Continued.

by two dealers, sitting opposite each other on a blanket, each backed by two or more singers and a drummer. The game commences by one of the dealers taking the sticks in both hands, about equally divided, and holding them behind his back and in that position shuffling them from hand to hand, after which he brings them in front of his body with both hands extended and the sticks grasped so the players can not see the centers. The opposite dealer clasps his hands together two or three times and points to the hand which he thinks holds the stick with the black center. Should he guess correctly he takes the deal and holds it until his opponent wins it back in like manner. For each failure a forfeit is paid, also the dealer pays a forfeit when he loses the deal. Friends of each party make outside bets on the dealers; each dealer's band plays and sings as long as he holds the deal.

No. 125. Gambling tools (sticks), Natano (Hoopa) Indians; native name, "Kin-nah-e-lah." This game is essentially the same as that described in No. 124, except they use a smaller number of sticks and the joker is blacked only in the center, the balance at both ends and center. Both games are called Kin.

No. 126. Head pad worn to protect the head while packing.

Lieut. P. H. RAY, U. S. A., Fort Gaston, California. 17239. '86. (II, A)

CHEMICAL MATERIALS showing the manufacture of carbonate of magnesia from the raw material to the finished products. Also specimens of Epsom salts from the same raw material, and Kieserite from the Stässfort mines.

COLUMBIA CHEMICAL WORKS, Brooklyn, New York. 17240. '86. (I)

FLUOR-SPAR.

J. F. CUMMINS, Golconda, Pope County, Illinois. 17241. '86. (XVI)

WOOD-RAT, *Neotoma floridana*.

G. NOBLE, Savannah, Georgia. 17242. '86. (IV)

CASTS OF FACES (15).

Dr. OTIS R. BACHELER. (Through Charles Jensen, New Hampton, New Hampshire. 17243. '86. (II)

BLACK-HEADED PARALOTE, *Paralotus melanocephalus*, from Australia.

Dr. L. STEJNEGER, U. S. National Museum. 17244. '86. (V, A)

LEPIDOPTERA, from Texas.

A. BOLTER, Chicago, Illinois. 17245. '86. (X)

COIN. A Mormon five-dollar gold piece, from Great Salt Lake City, Utah.

JOSEPH LIBBEY, West Washington, District of Columbia. 17246. '86. (I)

FOSSIL LEAVES from a coal mine shaft, 55 feet deep, 1,300 feet above the sea-level.

J. D. HOFF, Elsinore, California. 17247. '86. (XIV)

INSECT, *Strategus julianus*, Burm.

C. H. MAUK, Tombstone, Arizona. 17248. '86. (X)

SHARK, *Hexanchus griseus*.

D. M. ETHERIDGE, Keeper, Currituck Inlet Life-Saving Station, North Carolina. 17249. '86. (VII)

GLACIAL BIRD'S EYE LIMESTONE, found at Henderson Bay, Jefferson County, New York.

D. S. MARVIN, Watertown, New York. 17250. '86. (XVII)

NEST AND EGGS (4) of Dickcissel, *Spiza americana*.

W. H. ADAMS, Elmore County, Illinois. 17251. '86. (V, B)

SHELLS, *Unio rectus*, *U. luteolus*, *U. plicatus*, *U. phascolus*, *U. cornutus*, *U. obliquus*, and *U. coccineus*.

Dr. W. S. NEWLON, Oswego, Kansas. 17252. '86. (IX)

COTTON AND WORSTED GOODS, dyed with coal-tar colors.

H. SALTONSTALL, Pacific Mills, Boston, Massachusetts. 17253. '86. (I)

BIRD SKINS from the Phillipines, *Cuncuma leucogaster, Cacatua hæmaturopygia, Tanygnathus lozoniensis, Prioniturus discurus, Dryococcyx harringtoni, Picus (Dendropicus) gutturalis, Picus (Dendropicus) javensis hargitti, Pious (Chloropicoides) everetti* (sp.), *Alcedo (Halcyon) cyanopectus, Alcedo (Ceyx) rubra, Merops bicolor, Eurystomus orientalis, Prionochilus percussus, Cyrtostomos aurora, Irena tweedali, Oriolus xanthonotus, Buchanga leucophæa, Parus (Machlolophus) amabilis, Corvus pusillus, Ptilopus (Leucotreron) gironieri, Treron nasica, Megapodius cumingii, Ardea (Butorides) javanica, Erythra phœnicura.* From Cochin-china: *Palæornis lathami, Megalæma hæmacephala, Oriolus diffusus, Buchanga leucogenys, Lanius cristatus, Chalcostetha pectoralis, Passer jugiferus, Crypsirhina varians, Ardeola leucoptera, Sterna melanauchen.* From Madagascar: *Polyboroides madagascariensis, Astur francesii, Scops mendanensis, Coracopsis obscura, Coracopsis nigra, Poliopsitta cana, Poliopsitta cana, Leptosomus afer, Coua cærulea, Coua cristata, Corythornis cristatus vintsioides, Ispidina madagascariensis, Brachypteracias leptosomus, Brachypteracias squamiger, Bernieria madagascariensis, Hypsipetes madagascariensis, Hartlaubia madagascariensis, Euryceros prevosti, Artamia viridis, Leptopterus chabert, Artamia leucocephala, Tylas edwardsi, Vanga curvirostra, Cyanolanius tricolor, Calicalicus madagascariensis, Caprimulgus madagascariensis, Corvus scapulatus, Merops superciliosus, Foudia madagascariensis, Funingus madagascariensis, Vinago australis, Charadrius percuarius.* From Mayotte: *Astur brutus, Leptosomus afer, Funingus sganzini.* From Africa: *Haliætus vocifer, Chalcomitra gutturalis, Streptopelia levaillanti.* From Cape Horn, Patagonia: *Phrygilus gayi, Graculus carunculatus.* (Exchange.)

M. MILNE EDWARDS, Musee d'histoire naturelle, Paris, France. 17254. '86. (V, A)

MODEL of a small pueblo near Pueblo Alto, Chaco Cañon, New Mexico.

BUREAU OF ETHNOLOGY, Washington, District of Columbia. 17255. '86. (II, A)

TUMOR—myoma—taken from a shad. "This tumor seems to be composed of fibrous tissue in part, and was doubtless caused by some irritating body swallowed by the shad a good while ago. The specimen is a novelty in animal pathology. It probably grew from one side of the intestine." *

GOLDEN and SMITH, Washington, District of Columbia. 17256. '86. (XXII)

ARGENTINE, *Argentina* sp. Found on the beach near Fletcher Neck Life-saving Station, Maine. A rare visitor on our coast.

E. H. BUNKER, Biddeford Poll, Maine. 17258. '86. (VII)

PLANTS (15 Alpine species), from the White Mountains, New Hampshire.

WALTER DEANE, Cambridge, Massachusetts. 17259. '86. (XV)

PLANTS (about 300 species) from North Carolina, a locality rarely visited by botanists.

GERALD MCCARTHY, Kendall Green, Washington, District of Columbia. 17260. '86. (XV)

PLANTS (343 species) from the Yellowstone Park.

U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through Frank Tweedy.) 17261. '86. (XV)

AMERICAN SMELT, *Osmerus mordax.*

W. C. HARRIS, New York City. 17262. '86. (VII)

MARINE INVERTEBRATES collected by the U. S Steamer *Enterprise*, A. S. Baker commanding, during her cruise from Wellington, New Zealand, to the United States, in the South Pacific and Atlantic Oceans.

BUREAU OF NAVIGATION, Washington, District of Columbia. 17263. '86. (XI)

* Report of Dr. John S. Billings, U. S. A., Curator, Army Medical Museum.

CALIFORNIA MOUNTAIN TROUT, *Salmo irideus*. Hatched and raised at Wytheville, Virginia.

U. S. FISH COMMISSION, Washington, District of Columbia. 17264. '86. (VII)

IVORY-BILLED WOODPECKER, *Campephilus principalis*, ♀ (head).

E. C. GREENWOOD, Marco, Florida. 17265. '86. (XII)

MATERIA MEDICA. *Elephanta rhiza*, a rare drug.

THOMAS CHRISTY, London, England, 17266. '86. (I)

IRON SPEISSE.

O. H. HAHN, South Pueblo, Colorado. 17267. '86. (XVIII)

PEARL BAITS of various kinds. Old and curious.

W. HOLBERTON, New York City. 17268. '86. (I)

MINERAL CABINET (20 specimens).

H. A. TAMMEN, Denver, Colorado. 17269. '86. (XVI)

METEORIC IRON AND STONE (8 specimens).

Dr. J. BERRIEN LINDSLEY, Nashville, Tennessee. 17270. '86. (XVI)

MINERALS, (58 specimens). (Exchange.)

Prof. B. K. EMERSON, Amherst, Massachusetts. 17271. '86. (XVI)

ROCKS (56 specimens). (Exchange.)

Prof. B. K. EMERSON, Amherst, Massachusetts. 17271. '86. (XVII)

ARTIST'S PROOF of the engraving of General Grant, by Marshall.

HUBBARD BROS., Philadelphia, Pennsylvania. 17272. '86. (I)

MORTUARY MEDAL. Maréchal de Ligne, Marshal of France. Cast from cannon captured by Napoleon I, and issued to some of the invalids of the French veteran corps.

PAUL BECKWITH, Saint Louis, Missouri. 17273. '86. (I)

ARGYRODITE, from which was obtained the new metal, Germanium; from Himmelsfürst, near Brand, Freiberg, Saxony.

W. F. HILLEBRAND, U. S. Geological Survey. 17274. '86. (XVI)

"CARANNA RESIN," used by the natives of Central and South America for applications to sores, bruises, cuts, and for reducing swellings and glandular enlargements.

FREDERICK STEARNS AND CO., Detroit, Michigan. 17275. '86. (I)

TUSK OF ELEPHANT, *Loxodon africanus*. A section prepared from the part of the tusk of "Jumbo," which was buried in his head.

HENRY A. WARD, Rochester, New York. 17276. '86. (XII)

RED-TAILED HAWK, *Buteo borealis*.

JOHN K. WALKER, Parkersburgh, Illinois. 17277. '86. (V)

SOAPSTONE BOWL, found in opening a soapstone quarry on the west bank of the Potomac River, about 7 miles above West Washington, District of Columbia.

JOHN W. BROCK, Philadelphia, Pennsylvania. 17278. '86. (III)

DECORTICATED TREE TRUNKS.

JOHN W. BROCK, Philadelphia, Pennsylvania. 17278. '86. (XIV)

CALCITE CRYSTALS attached to coal.

R. ELLSWORTH CALL, Moline, Illinois. 17279. '86. (XVI)

TRENTON FOSSILS.

W. A. FINKELNBERG, Winona, Wisconsin. 17280. '86. (XIII, A)

CAGE BIRD, *Chysotis leucocephalus*.

ROBERT RIDGWAY, U. S. National Museum. 17281. '86. (V, A)

RED-TAILED HAWK, *Buteo borealis*.

J. SCHNECK, Mount Carmel, Illinois. 17282. '86. (V, A)

DEVONIAN FOSSILS (60 specimens).
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through C. D. Walcott.) 17283. '86. (XIII, A)

CARBONIFEROUS FOSSILS, from Eastern Tennessee (83 specimens).
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through C. D. Walcott.) 17284. '86. (XIII, A)

BIRD SKINS (26 specimens), from South America. (Exchange.)
H. K. COALE, Chicago, Illinois. 17285. '86. V, A)

FOSSILS: Devonian, Silurian, and Ordovician (3,500 specimens), from Indiana and Kentucky.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17286. '86. (XIII, A)

EGGS of mud minnow, *Umbra limi*.
W. P. SEAL, Philadelphia, Pennsylvania. 17287. '86. (XXI)

FOSSIL PLANTS (7 specimens), from the southern slope of Cumberland Mountain.
C. D. WALCOTT, U. S. Geological Survey. 17288. '86. (XV)

FOSSIL PLANTS (6 specimens), from near Wales, Utah.
Dr. C. A. WHITE, U. S. Geological Survey. 17289. '86. (XIV)

MONKEY, *Cercocebus albigena*, from the Congo region, Africa.
ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania. (Through Arthur Edwin Brown, Esq.) 17290. '86. (IV)

BIRD SKINS, 51 species (524 specimens), from the Bahamas.*
U. S. FISH COMMISSION, Washington, District of Columbia. 17291. '86. (V, A).

NESTS of *Turdus mustelinus*, *Mimus polyglottos*, *Cistothorus palustris*, *Geothlypis trichas*, *Vireo olivaceus*, *Melospiza fasciata*, *Spizella socialis*, *Setophaga ruticilla*, *Contopus virens*, and *Spinus tristis*.
C. R. RADCLIFFE, New York City. 17292. '86. (V, B)

PHOTOGRAPH of a tooth of mammoth, *Elephas* sp., found one mile from Arlington, Oregon, at an altitude of six or eight hundred feet, in clay about twelve feet deep.
JAMES W. SMITH, Alkali, Oregon. 17293. '86. (XII)

STALAGMITES (2 specimens).
ALEXANDER R. SHEPHERD, Batopilas, Mexico. 17294. '86. (XVII)

FUNGUS, a curious specimen.
ALEXANDER R. SHEPHERD, Batopilas, Mexico. 17294. '86. (XV)

ANTIQUE POTTERY, minute but interesting specimens.
Rev. DAVID F. WATKINS, Guadalajara, Mexico. 17295. '86. (II, B)

PICTURE of a menhaden steamer, and one purse-net.
DANIEL F. CHURCH, Tiverton, Rhode Island. 17296. '86. (I)

INDIAN STONE AXES, from Connecticut and Pennsylvania. (Exchange.)
A. F. WOOSTER, Norfolk, Connecticut. 17297. '86. (III)

WOOL raised in Australia.
G. W. GRIFFIN, U. S. Consul, Sydney, Australia. (Through Department of State.) 17298. '86. (I)

METEORIC IRON, from Tennessee.
ACADEMY OF NATURAL SCIENCES, Philadelphia, Pennsylvania. 17299. '86. (XVI)

SPINNING-WHEEL, from Ohio.
CHARLES BECK, Washington, District of Columbia. 17300. '86. (I)

NEST of Golden-winged Warbler, *Helminthophaga chrysoptera* Linn., from Petersburg, Virginia.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through Charles W. Richmond.) 17301. '86. (V, B)

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* See report of Department of Birds, p. 156.

ARROWHEADS (8), from Lehigh Island.
A. F. BERLIN, Allentown, Pennsylvania. 17302. '86. (III)

INSECTS: *Trogus Rileyi*, *Diceroa tenebrosa*, and *Pachyta monticola*, rare species.
W. W. HILL, Albany, New York. 17303. '86. (X)

BORING of *Monarthrum mali*, in red oak.
E. A. SCHWARZ, Washington, District of Columbia. 17304. '86. (X)

BIRD SKINS: *Cypseloides niger*, *Calliste floridana* (the only example in any American collection), *Euphonia gracilis* ♀, and *Pipra coracina* ♂.
JOSÉ C. ZELEDON, San José, Costa Rica. 17305. '86. (V, A)

ETHNOLOGICAL OBJECTS: Nepaul kookrie sheath, containing broad knife for use as a weapon; 2 small knives used in eating, and a purse or bag for money, from Nepaul, India.
WILLIAM H. DALL, U. S. Geological Survey. 17306. '86. (II, A)

DOUBLE-HEADED SNAKE.
Dr. J. M. SPAINHOUR, Lenoir, North Carolina. 17307. '86. (VI)

INDIAN IMPLEMENT, egg-shaped and made of iron ore.
Dr. J. M. SPAINHOUR, Lenoir, North Carolina. 17307. '86. (III)

MENHADEN, *Brevoortia tyrannus*.
DANIEL T. CHURCH, Tiverton, Rhode Island. 17308. '86. (VII)

BIRD SKINS. A valuable and interesting collection, consisting chiefly of desiderata from South America, nearly all of which are new to the Museum collection. The collection consists of the following specimens: *Turdus aliciæ* Baird, Merida; *Turdus gigas pallidirostris* Berl. M. S., Merida; *Henicorhina hilaris* Berl. and Tacz., ♂, Cayandeled; *Thryophilus longirostris* (Vieill.), Bahia; *Thryothorus sclateri* Tacz., Bogota; *Troglodytes striatulus* Lafr., Bucaramanga; *Basileuterus cabanisi* Berl., Merida; *Setophaga albifrons* Scl. and Salv., Merida; *Conirostrum atrocyaneum* Lafr., ♂, Tambillo; *Compsocoma sumptuosa cyanoptera* (Cab.), ♂, Chaguarpata; *Compsocoma sumptuosa cyanoptera*, ♀, Cayandeled; *Nemosia ornata* Scl., ♀, Cayandeled; *Buarremon castaneifrons* Scl. and Salv., Merida; *Saltator superciliaris* (Spix), Pebas; *Orchesticus ater* (Gml.) = *Tanagra olivina* Scl., juv., Bucaramanga; *Chrysomitris siemiradzii* Berl. and Tacz. ♂, Guayaquil; *Cyanocitta meridana* Scl. and Salv., Merida; *Cyanocorax affinis sclateri* (Heine), Baranquilla; *Euscarthmus impiger* Scl. and Salv., Bucaramanga; *Myiarchus pelzelni* Berl., Bahia; *Elainea mesoleuca* Cab. and Heine, ♀, Taguara; *Pipreola melanolæma* Scl., ♂, Merida; *Pipreola melanolæma*, ♀, Merida; *Furnarius agnatus* Scl. and Salv., Baranquilla; *Thripophaga sclateri* Berl., Taguara; *Philydor striaticollis* Scl., ♀, Mapoto; *Thamnophilus plumbeus* Scl., ♂ juv., Rio Tigre; *Thamnophilus unicolor* (Scl.), ♂, Cayandeled; *Thamnophilus multistriatus* Lafr., ♂, Bucaramanga; *Myrmeciza squamosa*, Pelz., ♀, Sta. Catarina; *Scytalopus fuscoides* Lafr., Chili; *Petasophora anais* (Less.), Merida; *Petasophora cyanotis* (Bourc.), ♀, (?), Merida; *Bourcieria conradi* (Bourc.), ♂, Merida; *Eriocnemis smaragdinipectus* Gould., ♂, San Rafael; *Amazilia warszewiczi braccata* (Heine), Merida; *Amazilia warszewiczi*, *Panychlora stenura* Cab. and Heine, ♂, jr., Merida; *Chætocercus rosæ* (Bourc. and Muls.), ♂, jr., and ♀ ad. Merida; *Lurocalis nattereri* (Tem.), S. Brazil; *Hydropsalis furcifera* (Vieill.), ♂, São Laurenço; *Stenopsis cayennensis* (Gmel.), ♂, Roraima; *Conurus rosecifrons* Gray, ♀, Tarapoto; *Bolborhynchus monachus* (Bodd.), La Plata; *Brotogerys jugularis* (Deville), Yguitos; *Brotogerys tui* (Gml.), ♂, Nauta; *Syrnium suinda* (Vieill.), Taguara, *Columba plumbea* (Vieill.), ♀, Taguara; *Chamæpetes goudoti* (Less.), ♂, Cayandeled; *Tinamus solitarius* (Vieill.), Blumenau; *Crypsirhina varians*, Java; *Xanthodira flavicollis*, Malabar; *Geocichla cyanotus*, East India; *Gallinago wilsoni*, Merida; *Helminthophaga chrysoptera*, Merida; *Turdus usulatus* (?), Guatemala and Ecuador; *Iache latirostris*, and *Iache* sp. (?), Tres Marias.

MUSEUM HANS VON BERLEPSCH, Münden, Province of Hanover, Germany. 17309. '86. (V A)

SPECIMENS, illustrating the manufacture of cotton thread.
WILLIMANTIC LINEN COMPANY, Willimantic, Connecticut. 17310. '86. (I)

LIZARD, *Coleonyx variegatus* Bd., from Mohave, Kern County, California.
A. KOEBLE, Los Angeles, California. 17311. '86. (VI)

HOLOTHUREANS, *Thyonella gemmata*, var., from Beaufort, North Carolina.
Dr. W. H. HOWELL, Baltimore, Maryland. 17312. '86. (XI)

ARTIST'S PROOFS of lithograph of General Grant's Arabian horses. (4)
RANDOLPH HUNTINGTON, Rochester, New York. 17313. '86. (IV)

COLEMANITE.
Prof. HENRY G. HANKS, San Francisco, California. 17314. '86. (XVI)

SERPENTINE and calcite, from Canada.
WILLIAM H. DALL, U. S. Geological Survey. 17315. '86.

PIGMY SPERM WHALE, *Kogia breviceps*.
GEORGE SAYERS, Keeper, Sea Isle City Life-Saving Station, Sea Isle City, New Jersey. 17316. '86. (VII)

FURNACE SLAG, from Coal Creek, Tennessee.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through Dr. O. B. Reese.) 17317. '68. (XVII)

PHOTOGRAPHS of Osage and Ute Indians. (17.)
BUREAU OF ETHNOLOGY, Washington, District of Columbia. 17318. '86. (II, A)

GLASS-WARE. "Pomona" vases, etc.
NEW ENGLAND GLASS WORKS. (Through M. W. Beveridge, Washington, District of Columbia.) 17319. '86. (I)

WORM-TUBES, from a spring near Lititz, Pennsylvania.
H. A. BRICKENSTEIN, Linden Hall Seminary, Lititz, Lancaster County, Pennsylvania. 17320. '86. (XI)

CALIFORNIA SALMON, *Oncorhynchus chouicha*, and Steel-head Salmon, *Salmo gairdneri*.
E. G. BLACKFORD, New York City. 17321. '86. (VII)

RING-TAILED MONKEY, *Ateles arachnoides*, in the flesh.
BARTON & LOGAN, Dime Museum, Washington, District of Columbia. 17322. '86. (IV)

COINS. Spanish-American silver dollar, 1769. Spanish two-real piece; XII-shilling silver coin of Danish West Indies, 1740; nickel penny of Jamaica, 1869; and Massachusetts copper cent. (Deposited.)
A. A. DULY, U. S. National Museum. 17323. '86. (I)

CARBONIFEROUS FOSSILS.
W. C. KNIGHT, Lincoln, Nebraska. 17324. '86. (XIII, A)

RED-BREASTED MERGANSER, *Merganser serrator*.
JOHN JENSEN, Wood's Holl, Massachusetts. 17325. '86. (V, A)

RUSTY GRACKLES, *Scolecophagus ferrugineus* (2 skulls).
W. H. BABCOCK, Washington, District of Columbia. 17326. '86. (VIII)

REPTILES. *Eutænia sirtalis*, *Rana palustris*, *R. catesbiana*, *R. silvatica*, *R. clamata*, and *Bufo lentiginosus*.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through H. W. Henshaw.) 17327. '86. (VI)

HALF-GUINEA of Great Britain, George III., 1790. (Copy in brass.)
JOSEPH SESSFORD, Smithsonian Institution. 17328. '86. (I)

ARROWHEADS made by a foot-treadle machine.
GEORGE E. SELLERS, Bowlesville, Illinois. 17329. '86. (II)

PRESSED SULPHIDE of silver in the form in which the silver is recovered from the leaching solution.
FRED. W. TAYLOR, Lake Valley, New Mexico. 17330. '87. (XVIII)

ANCIENT SCULPTURED STONE brought to the United States by Commander Skinner, U. S. N. (3 pieces.)

Mrs. W. HEMPHILL JONES, Washington, District of Columbia. 17331. '86. (I)

CONFEDERATE CAPTAIN'S UNIFORM coat of Company "H," Twenty-fourth Regiment, Virginia.

O. W. BARROW, Danville, Virginia. 18332. '86. (I)

PHOTOGRAPH of the Berlin Archeopteryx (full size). (Exchange.)

Mrs. G. BROWN GOODE, Washington, District of Columbia. 17333. '86. (XII)

ONE-DOLLAR BILL, Colonial Bank of Canada, May 8, 1839.

J. BENJAMIN CLAYTON, U. S. National Museum. 17334. '86. (I)

RED SETTER, *Canis familiaris.*

JAMES T. WALKER, Palmyra, New York. 17335. '86. (IV)

JUMPING MOUSE, *Zapus hudsonius.*

J. M. C. EATON, Irvington, New Jersey. 17336. '86. (IV)

ROCKLING, *Onos cimbrius*, from Ipswich Bay.

WILLIAM WILEY, Massachusetts. 17337. '86. (VII)

BIRD SKINS (5), *Drymoica extensicauda, Acanthis exilipes*, and *A. cabaret.*

W. E. BROOKS, Milton, Ontario, Canada. 17338. '86. (V, A)

PORCELAIN WARES. A pair of dishes (painted under glaze); a pair of dishes (painted over glaze); Nishi tsushi shiro ishi (stone like body clay, natural); Nishi tsushi shiro ishi (powdered); Sakoi shiro tsuchi (stone like body clay, natural); Sakoi shio tsuchi (powdered); Sakoi mizu ana ishi (stone like body clay, natural); Sakoi Mizu ana ishi (powdered); Tsuzi ishi (stone-like body clay, natural); Tsuzi ishi (stone like body clay, powdered); Sakai tsuchi (stone like body clay, natural); Sakai tsuchi (powdered). Glaze stone A (natural); glaze stone (elutriated); glaze stone B (natural); Goto clay (body clay); Taister clay (body clay); prepared body clay; a pair of flower-pots painted under glaze with Gosu cobalt; Gairom (body clay, natural); Gairome (elutriated); Kibushi (body clay, natural); Kibushi (elutriated); Hiromi ishi (glazestone); Hiromi (elutriated); Giaman (elutriated; silica used for glaze and body). A pair of flower-pots (white); Kakitani tsuchi (body clay, natural, first quality); Kakitani tsuchi (elutriated); Kakitani tsuchi (second quality); Kakitani tsuchi (third quality); Hitani tsuchi (body clay, natural); Hitani tsuchi (elutriated, first quality); Hitani tsuchi (second quality); Hitani tsuchi (elutriated); Hitani tsuchi (third quality, elutriated). Mixture, No. 23, 29, and 33; elutriated ash for glaze; Oyabui (elutriated ash for glaze); prepared clay (first quality); prepared clay (second quality); a pair of flower-pots (painted); Amakusa tsuchi (body clay); Araishi; Shigaraki ishi (body clay); glaze (first quality); Flower-pots (painted); flower-pots (white); cake box with cover; Gorokuji ishi (body clay); Nabelani ishi (body clay); Sano ishi (glaze clay); Sano ishi (elutriated); body for Kutani ware (mixture of No. 51 and 52); tsuki bai (ash for glaze); Itsuki bai (elutriated); Rea pigment for painting over glaze; Gosu (natural cobalt, one powdered); a pair of flower-pots (white); flower-pot (painted); Bora tsuchi (body clay); Bora tsuchi (elutriated); Neba tsuchi (body clay); Neba tsuchi (elutriated); Shiro tsuchi (body clay, natural); Shiro tsuchi (elutriated); Suna (sand for glaze); Suna (elutriated); Kioromine tsuchi (body clay); Kioromine (elutriated); Clay for glaze (natural); Clay for glaze (elutriated); prepared glaze; a pair of flower-pots (painted); Okazaki tsuchi (painted); Shigaraki tsuchi (painted); Shigaraki tsuchi (for glaze); Shiraye tsuchi (body clay); Kisi ishi (clay for glaze); Isubai (ash for glaze); Koya bai (ash for glaze); Kinsu, or tea-pot (painted); a pair of flower-pots (painted); Obuke tsuchi (gray body clay, natural); Obuke tsuchi (elutriated); Obuke tsuchi (brown body clay (natural); Obuke tsuchi (elutriated); Igaishi (glaze stone, natural); Igaishi (elutriated); prepared clay, gray; prepared clay, brown.

DEPARTMENT OF EDUCATION, Tokyo, Japan. 17339. '86. (I)

ORNAMENT made of sheep-skin and beads, having totemic devices; taken from the head of a dead Indian warrior.
JAMES M. NULL, McKenzie, Tennessee. 17340. '86. (II, A)

OPHIURAN, from Boca Ceiza Bay, Florida.
JOHN R. JONES, Tampa, Florida. 17341. '86. (XI)

TRENTON FOSSILS (339 specimens).
H. C. POWERS, Beloit, Wisconsin. 17342. '86. (XIII, A)

WEATHERED LIMESTONE, siliceous concretions and stylobites; from Tennessee.
IRA SAYLES, U. S. Geological Survey, Washington, District of Columbia. 17343. '86. (XV)

BIRDS, *Junco hyemalis carolinensis*, from North Carolina.
WILLIAM BREWSTER, Cambridge, Massachusetts. 17344. '86. (V, A)

EUROPEAN BADGER, *Meles taxus*, in the flesh.
CENTRAL PARK MENAGERIE (through W. A. Conklin, esq., New York City). 17345. '86. (IV)

NEST AND EGGS of European Goldfinch, *Fringilla carduelis* Linn.
E. T. ADNEY, New York City. 17346. '86. (V, B)

ARROWS (3) used by the "Prairie Dog Indians."
A. M. STEPHENS, Keam's Cañon, Arizona. 17347. '86. (II, A)

FOSSIL CORN, from slope of the Lehigh Coal and Navigation Company's Mine, Pennsylvania.
JOHN W. BROCK, Philadelphia, Pennsylvania. 17348. '87. (XIV)

ATLANTIC SALMON, *Salmo salar* (probably var. *sebago*), from Ragety Point, Lower Potomac.
R. A. GOLDEN, Washington, District of Columbia. 17349. '87. (VII)

STONE PESTLE, from Grant's Pass, Oregon.
CHARLES ALDRICH, Webster City, Iowa. 17350. '86. (III)

COAL.
Dr. WOLFRED NELSON, New York City. 17351. '86. (XVIII)

MATERIA MEDICA, from Panama.
Dr. WOLFRED NELSON, New York City. 17351. '86. (I)

HAND PAPER MOLD, imported from London in 1815.
HENRY W. MILLER, Worcester, Massachusetts. 17352. '86. (I)

ENGLISH HAND-MADE TACKS and samples of very small tacks, weighing 4 ounces to the thousand. (Deposited.)
HENRY W. MILLER, Worcester, Massachusetts. 17352. '86. (XVIII)

ALUMINUM BRONZE.
COWLES ALUMINUM COMPANY, Cleveland, Ohio. (Through Dr. T. M. Chatard, U. S. Geological Survey.) 17353. '86. (XVIII)

SANDSTONE CONCRETIONS, from Dickinson, Dakota Territory; ferruginous concretion, from Glendive, Montana Territory; volcanic dust, from Norton County, Kansas.
Dr. A. C. PEALE, U. S. Geological Survey, Washington, District of Columbia. 17354. '86. (XVII)

STONE AX, double-grooved, unfinished, from Lancaster County, Pennsylvania. (Exchange.) A. F. WOOSTER, Norfolk, Connecticut. 17355. '86. (III)

ALLIGATOR, from New Orleans, Louisiana.
Mrs. A. TAUSSIG, Washington, District of Columbia. 17356. '86.

COPPER COIN. One bajocco, 1851, of Pope Pius IX.
CALHOUN PATTERSON, Rockville, Maryland. 17357. '86. (I)

HATCHET, brought from Scotland in 1685; piece of ancient linen; a "sampler"; six tidies, linen thread, and five pairs of stockings. (Deposited.)

Mrs. MARGARET BISHOP, Attica, New York. (Through A. J. Lorish). 17358. '86. (I)

ALGERIAN MARBLE (5 slabs). A valuable addition to the collection, both on account of their beauty and from the fact that they were taken from the old Roman quarries in Algeria, which have for many years been lost sight of, but which have recently been re-opened by a Belgian company.

E. FRITSCH, New York City. 17359. '86. (XVIII)

COLORED PRINTS of Lady and George Washington, published over one hundred years ago, by J. Testi, London.

C. R. WHEDON, New Haven, Connecticut. 17360. '86. (I)

GALVANOPLASTIC COPIES of fossil Amphibians, *Stegocephali*.

Dr. ANT. FRITSCH, Prague, Bohemia, Austria. 17361. '86. (XII)

BIRD SKINS. A collection of 101 species (148 specimens), containing *Helinaia swainsoni* and *Ornithion ridgwayi*, the latter being previously not represented in the collection.

CHARLES K. WORTHEN, Warsaw, Illinois. 17362. '86. (V, A)

BENGAL TIGER, *Felis tigris*, in the flesh.

P. T. BARNUM AND CO., Philadelphia, Pennsylvania. 17363. (IV)

PIPE made of laurel root, cane stem, by a mountaineer of Cumberland Gap, in the summer of 1875.

JOHN MURDOCH, U. S. National Museum. 17364. '86. (II, A)

CARBONIFEROUS FOSSILS (107 specimens).

U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17365. '86. (XIII, A)

CARBONIFEROUS FOSSILS, from New Jersey. (318 specimens, collection of the 40th Parallel Survey.)

U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17366. '86. (XIII)

SEALING WAX. A collection of various kinds, to replace accession 15463, which was injured by heat.

DENNISON MANUFACTURING COMPANY, Philadelphia, Pennsylvania. 17367. '86. (I)

MICROSCOPIC SLIDES of British sponge,* including many types of Bowerbank (268 specimens). (Exchange.)

Rev. A. M. NORMAN, Durham, England. 17368. '86. (XI)

BAY LYNX, *Lynx rufus* (skull), from near Fort Verde, Arizona.

B. J. D. IRWIN, U. S. Army. 17369. '86. (XII)

SKINNING KNIVES (12), found near Lumberton, New Jersey.

W. H. H. CHAMBERS, Philadelphia, Pennsylvania. 17370. '86. (III)

TENCH, *Tinca vulgaris*, from the Potomac River.

GWYNN HARRIS, Washington, District of Columbia. 17371. '86. (VII)

COMMON MACKEREL, *Scomber scombrus*, from Chesapeake Bay, near the mouth of the Potomac River.

W. YEATMAN, Keeper, Point Lookout light-house, Maryland. 17372. '86. (VII)

RED POLL, *Acanthis linaria* (3 specimens), from Canada; and *Phyllopseustes borealis*, from Burmah.

W. E. BROOKS, Milton, Ontario. 17373. '86. (V, A)

STONE SINKER, smooth, oblong, with a groove around one end.

T. W. CASTLEMAN, Saint Joseph, Louisiana. 17374. '86. (III)

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* See report of the Department of Marine Invertebrates, p. 200.

AMERICAN MINK, *Putorius vison*, in the flesh.
JOHN JANSEN, Wood's Holl, Massachusetts. 17375. '86. (IV)

NEST AND EGGS of *Harporhynchus lecontei*. (Purchased.)
F. STEPHENS, San Bernardino, California. 17376. '86. (V, B)

CHIRIQUI POTTERY, for classification.
JOHN S. LAMSON & BRO., New York City. 17377. '86. (II, B)

PUBLICATIONS: "Early Coins of America," "The Coinage of America and the World, Ancient and Modern," "The Coins of the Bible." (Pamphlets:) "The Coin Chart Manual," "Illustrations of Copper Coins," "Young Collector's Hand-Book," "Catalogue of Paper Money," "Statutes Relating to the United States Coins," "Premium List of Prices Paid," "The Curiosity Cabinet," "Coin Collectors' Journal," January to April, 1886. (Exchange.)
SCOTT STAMP AND COIN COMPANY, New York City. 17378. '86. (I)

FOSSIL SHELLS, *Productus semireticulatus*, Martin; also a cast of the interior ventral valve of *Spirifera Logani*, Hall.
WILEY BRITTAIN, Springfield, Missouri. 17379. '86. (X)

INSECT, *Dytiscus*, a species allied to *fasciventris*.
FRANK P. GOLD, Rest, Virginia. 17380. '86. (X)

NEST AND EGGS of Song Sparrow, *Melospiza fasciata*.
J. A. BALMER, Paris, Edgar County, Illinois. 17381. '86. (V, B)

ETHNOLOGICAL OBJECTS: Jade inkstand and holder; Chinese historical illustrations; plate of Confucius and his disciples at the ancestral temple at Chou, and his discourse on that occasion; ten photographs, illustrating the manners and customs of China; two copies of the Daily Pekin Gazette, the oldest newspaper in the world—from China. Japanese magic mirror; Japanese writing copies; index to Somoku-Dusets, a great work on Japanese botany; two maps of Tokio, with English copy; Japanese edition of Siddharashta; Japanese encyclopedia for beginners, in ten volumes; thirty plates, with description of Japanese agricultural products; chart of the vegetable kiugdom, according to the natural system, in Latin and Japanese; Loo Choo plaque, lacquered and inlaid with mother of pearl.
Dr. D. B. MCCARTEE, Washington, District of Columbia. 17382. '86. (II, A)

PHOTOGRAPH of skull and skeleton of *Cervalces americanus*.
FRANKLIN C. HILL, Princeton, New Jersey. 17383. '86. (XII)

CONFEDERATE STATES RELICS: Official papers of the treasury and of the post-office departments; military orders of the Confederate States; paper money, postage-stamps, and a military button of the Confederacy.
C. G. ADDISON, Springfield, Maryland. 17384. '86. (I)

PAPER MONEY: Pennsylvania State bank bills, one dollar bill of Farmers' National Bank, Pottsville, and a five dollar bill of the Bank of Pennsylvania.
GEORGE W. SNYDER, Somerset, Pennsylvania. 17385. '86. (I)

COINS, medals, and tokens of ancient Rome and other ancient and modern countries.
Mrs. H. M. FOREMAN, Washington, District of Columbia. 17386. '86. (I)

SHELLS, *Tapes staminea*, from Seattle, Washington Territory.
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17387. '86. (IX)

CHINESE CABINET, or student's book-case.
K. PALM LEE, Chinese Legation, Washington, District of Columbia. 17388. '86. (II, A)

BIRD SKINS (6 species) from Europe and Siberia, including *Turdus alpestris*, and a gray-headed green woodpecker, described by the donor as a type of new subspecies, *Picus canus perpallidus*. (Exchange.)
Dr. L. STEJNEGER, U. S. National Museum. 17389. '86. (V, A)

SILVER AND COPPER COINS of the United States, Great Britain, Ireland, and Germany.
RALPH COLLIER, Laurel, Maryland. 17390. '86. (I)

SILVER BUCKLES and a pair of shoe buckles, once the property of Charles Carroll of Carrollton.
RALPH COLLIER, Laurel, Maryland. 17390. '86. (I)

BRASS TOKEN, or jeton, of Louis XV, King of France and Navarre.
MEREDITH S. DIGGS, U. S. National Museum. 17391. '86. (I)

MILK SUGAR manufactured in Switzerland, accompanied by reports on the same by the United States Consul in that country.
DEPARTMENT OF STATE, Washington, District of Columbia. 17392. '86. (I)

STONE LAMP, from the Eskimo of Smith Sound, Alaska.
Dr. EMIL BESSELS, Washington, District of Columbia. 17393. '86. (II, A)

UNIFORM COAT worn in the Confederate States army by a lieutenant of cavalry. (Deposited.)
C. W. MACFARLANE, Richmond, Virginia. 17394. '86. (I)

PHOTOGRAPHS of Apache Indians (14).
A. F. RANDALL, Deming, New Mexico. 17395. '86. (II, A)

INDIAN BEADS from a mound near Archer, Florida.
Dr. JAMES C. NEAL, Archer, Alachua County, Florida. 17396. '86. (III)

TURTLE, *Chelopus muhlenbergi*.
F. C. HILL, Princeton, New Jersey. 17397. '86. (XII)

RUSSIAN PETROLEUM as refined at Marseilles (2 bottles). Also consular report on this subject.
DEPARTMENT OF STATE, Washington, District of Columbia. 17398. '86. (I)

STONE IMPLEMENTS. Two polished celts from Abaco Island; fragment of worked bone from New Providence Island; celt and rubbing stone from New Providence Island; three celts, chisel, and a pendant from Watling Island; collected by the steamer *Albatross* during her cruise to the Bahamas.
U. S. FISH COMMISSION, Washington, District of Columbia. 17399. '86. (III)

MOLLUSCA, from the Bahamas.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (IX)

SKULL AND BONES, found in a cave on Watling Island. Also pieces of pottery.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (III)

MARINE INVERTEBRATES, from the Bahamas.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (XI)

BIRDS' NESTS AND EGGS, from the Bahamas.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (V, B)

SNAKES AND LIZARDS (127 specimens), from the Bahamas.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (VI)

TURTLE JIG, from Abaco Island.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (I)

LEAVES OF ALOES, from the Bahamas.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (I)

ROACHES (2), Hippoboscids (4), scorpions (5), myriapods (4), and spiders (13).
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (X)

RUSHES, from the Bahamas.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (I)

STRAW HAT and eight straw baskets.
U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (II, A)

MAMMALS, *Phyllonycterus sezekorni*, *Tursiops tursio*, *Mus musculus*, *Vesperugo serotinus*, *Procyon lotor* and *Mus decumanus*.

U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (IV)

BIRDS (425 species), 628 specimens); including *Saurothera bahamensis* and *Dendroica kirtlandi*, very rare; several new forms to be described as *Geothlypis tanneri*, *Centurus blakei*, and *Vireo crassirostris flavescens*, from the Bahamas. Also a collection from Key West containing a new species of *Vireo*.

U. S. FISH COMMISSION, Washington, D. C. 17400. '86. (V, A)

FISHES. *Eulamia milberti*, *Pteraclis carolinus*, *Notacanthus* n. sp., *Oreosoma* (?), *Paralepis*, *Gobiesox*, *Hæmulon*, *Lutjanus*, *Epinephelus*, *Harengula*, *Enneacentrus*, *Exocœtus*, *Arius*, *Hemirhamphus*, *Scopelus*, *Myrophis*, *Leptocephalus*, *Oligoplites*, *Echeneis*, *Synaphobranchus*, *Haloporphyrus*, *Macrurus*, *Scyllium pusillus*, *Hoplosthethus*, *Cyclothone*, *Læmonema*, *Maurolicus*, *Lycodes*, *Chlorophthalmus*, *Raia*, *Sigmops*, *Serrivomer*, *Melamphaës*, *Sternoptyx*, *Argyropelecus*, *Urolophus*, *Chaunax*, *Cottunculus*, *Apogon*, *Stephanoberyx*, *Lophius*, *Coryphænoides*, *Callionymus*, *Gonostoma*, *Dibranchus*, *Hippocampus*, *Dicrolene*, *Chauliodus*, *Malthe*, *Amitra*, *Stomias*, *Neobythites*, *Scorpæna*, *Plectromus*, *Synodus*, *Monocanthus*, *Antennarius*, *Halosaurus*, *Calamus*, *Sparisoma*, *Scarus*, *Carcharias*, *Balistes*, *Mugil*, *Glyphidodon*, *Atherina*, *Labrosomus*, *Pomacentrus*, *Xyrichthys*, *Platyglossus*, *Gobius*, *Julis*, *Leptocephalus*, *Tetrodon*, *Scopelus*, *Cyprinodon*, *Fierasfer*, *Syngnathus*, *Synodus*, *Dussumieria*, *Pomacanthus*, *Seriola*, *Caranx*, *Muræna*, from Bahama Islands.

U. S. FISH COMMISSION, Washington, District of Columbia. 17400. '86. (VII)

EGYPTIAN MUMMY.

Hon. S. S. COX, United States Minister to Turkey. 17401. '86. (II, A) (Described on page 50.)

OPOSSUMS, *Didelphys virginiana*, from near Bennings, District of Columbia.

W. B. SHAW, Washington, District of Columbia. 17402. '86. (IV)

KOREAN SILVER COINS, two one-shot = 15 cents, and one two-shot = 30 cents.

Lieut. W. A. MINTZER, U. S. Navy. 17403. '86. (I)

REPTILES, *Eutænia sirtalis sirtalis*.

H. C. BUMPUS, Providence, Rhode Island. 17404. '86. (VI)

FOSSIL BUTTER and a china dish, supposed to be over a hundred years old.

D. CHARLTON, Christiansburgh, Virginia. 17405. '86. (I)

MILITARY PASS to Fredericksburgh, dated Richmond, Virginia, September 2, 1861, and signed by John Letcher, governor of Virginia.

Capt. C. W. DUNNINGTON, U. S. National Museum. 17406. '86. (I)

FOSSILS, *Ammonites texanus* von Buch.

Capt. W. H. CLAPP, Fort Stockton, Texas. 17407. '86. (XIII, AB)

KAOLIN.

SAM H. HOUSTON, New Orleans, Louisiana. 17408. '86. (XVII)

NERKA SALMON, *Oncorhynchus nerka*.

E. G. BLACKFORD, New York City. 17409. '86. (VII)

INDIAN PAINTING on a deer skin. (Deposited.)

W. W. BLAKE, Estacion, Mexico. 17410. '86. (II, B)

DEPOSITS from Geyser Springs, Saratoga, New York.

Miss MARY E. MANN, Washington, District of Columbia. 17411. '86. (XVII)

ROCK SALT.

AMERICAN SALT COMPANY, New Iberia, Louisiana. (Through J. G. Haskell.) 17412. '86. (XVII)

CAST of a fossil tooth, *Elephas primigenius*, found in Kishwaukee River, near Marengo, Illinois.

O. P. ROGERS, Marengo, Illinois. 17413. '86. (XI)

ETHNOLOGICAL OBJECTS: Indian arrow-maker's tools, etc.
LOREN W. GREEN, Baird, Shasta County, California. 17414. '86. (II, A)

BATRACHIAN, *Amblystoma tenebrosum*.
LOREN W. GREEN, Baird, Shasta County, California. 17414. '86. (VI)

INSECT, *Strigamia* sp., one of the so-called centipedes.
LOREN W. GREEN, Baird, Shasta County, California. 17414. '86. (X)

OVEN-BIRD, *Seiurus aurocapillus*.
A. F. WOOSTER, Norfolk, Connecticut. 17415. '86. (V, A)

LEAST BITTERN, *Ardetta exilis*.
Hon. EDWARD THOMPSON, United States Consul, Merida, Yucatan. 17416. '86. (V, A)

PIKE, *Esox nobilior* (?). (Head.)
I. GARRARD, Frontenac, Minnesota. 17417. '86. (VII)

SMITH AND WESSON REVOLVER (six-shooter), found by a party of surveyors in the summer of 1883, on the Custer battle-field, near the Little Horn River, Montana. A relic of the Custer massacre of 1876.
Capt. CHARLES E. BENDIRE, U. S. A., U. S. National Museum. 17418. '86. (I)

SQUID, *Loligo pealii* Lesueur; from near Cape Henry.
GWYNN HARRIS, Washington, District of Columbia. 17419. '86. (XI)

WHITE PERCH, *Roccus americanus*.
G. WYLIE, Old Orchard, Maine. 17420. '86. (VII)

STAR-NOSED MOLE, *Condylura cristata*.
A. F. WOOSTER, Norfolk, Connecticut. 17421. '86. (IV)

PEPTONIZED BEEF.
W. H. MCDONALD, Washington, District of Columbia. 17422. '86. (I)

MEDALS. Gold medal of the Royal Geographical Society, 1858, patron's medal; gold medal, Victorio Emmanuelle II, 1858; gold medal, Oscar Rex Sveciæ Norwegice Goth. et Vandal.; bronze medal, exhibition of the works of industry of all nations, 1851. Presented to the late Professor Bache. (Deposited.)
NATIONAL ACADEMY OF SCIENCES.
(Through Prof. J. H. C. Coffin, Treasurer.) 17423. '86. (I)

STONE IMPLEMENTS. Thirty-six flakes, five rude chipped implements, and six fragments, apparently of leaf-shaped implements, from John's Island, at the mouth of Cheeshowiska River, Hernando County, Florida. In the letter accompanying these relics Mr. Willcox says: "One of the flakes contains the impression of a fossil sea-urchin, thus indicating the locality where the supply of chert-rock was obtained, viz, from Mason's Creek, 5 miles northwest of John's Island."
JOSEPH WILLCOX, Media, Pennsylvania. 17424. '86. (III)

WHITE FISH AND TROUT, from Northville, showing degrees of growth.
FRANK N. CLARK, Northville, Michigan. 17425. '86. (I)

PLASTER CAST of ideal restoration of *Plesiosaurus cramptoni*.
MUSEUM OF SCIENCE AND ART, Dublin, Ireland. 17426. '86. (VI)

OIL PAINTINGS, on silk, of Japanese costumes worn by girls of the merchant class.
Mrs. G. BROWN GOODE, Washington, District of Columbia. 17427. '86. (II, A)

COLORED ENGRAVING, representing the four flags adopted by the Confederate States, the State seal, and the silver half-dollar, of which only four were coined at New New Orleans in 1861.
PERCY CLARK, Washington, District of Columbia. 17428. '86. (I)

MARINE SHELLS (16 species, 50 specimens), mostly from the West Indies.
Mrs. C. H. DALL, Washington, District of Columbia. 17429. '86. (IX)

TABLE UTENSILS. Fork, spoon, and chopsticks of buffalo horn.
WILLIAM H. DALL, U. S. Geological Survey. 17430. '86. (II, A)

FISH. *Micropterus dolomiei* and *Ambloplites rupestris*, from Fairmount, West Virginia.
U. S. FISH COMMISSION, Washington, District of Columbia. 17431. '86. (VII)

QUILL PEN, used by General La Fayette at the Masonic lodge, Fredericksburgh, Virginia, during his visit to the United States in 1824 as the "guest of the nation." (Deposited.)
Mrs. R. B. SHACKELFORD, Washington, District of Columbia. 17432. '86. (I)

TIN CANDLE MOLDS, employed in domestic industry in America prior to 1860, and still somewhat in use in the rural districts.
Mrs. G. BROWN GOODE, Washington, District of Columbia. 17433. '86. (II, A)

ROCKS, from Pennsylvania.
HENRY J. BIDDLE. 17434. '86. (XVII)

GOLD MEDAL, presented to Professor Baird by the Department of Fish Culture of the Lower Seine, France. (Deposited.)
Professor SPENCER F. BAIRD, Washington, District of Columbia. 17435. '86 (I

DRAWING of a species of *Cobitis*, by a Chinese artist, Ningpo, 1859.
Dr. D. B. MCCARTEE, Washington, District of Columbia. 17436. '86. (VII)

SNAIL SHELL, *Helix hortensis* L. Imported. The locality is new for this species.
J H. MORRISON, Lexington, Virginia. 17437. '86. (IX)

TERRAPIN, *Cinesternum pennsylvanicum*, from Hatteras, North Carolina.
F. W. TRUE, U. S. National Museum. 17438. '86. (V)

REPTILES. *Gerrhonotus cæruleus*, and *Pityophis* sp., from Butte County, California.
H. W. TURNER, San Francisco, California. 17439. '86. (VI)

PEARL taken from *Venus mercenaria*.
G. W. WOLTZ, U. S. National Museum. 17440. '86. (IX)

OPERA HAT, *Chapeau-claque*, Berlin, Germany, 1880.
G. BROWN GOODE, U. S. National Museum. 17441. '86. (II, A)

DAMASCUS SWORD and eight ivory-and-gold-mounted knives of Arab manufacture, from Muscat. Presented to Commodore Shufeldt by the Sultan of Zanzibar.
Commodore R. W. SHUFELDT, U. S. Navy, Washington, District of Columbia. 17442. '86. (I)

MILK SUGAR (3 samples), from Germany and Switzerland.
DEPARTMENT OF STATE, Washington, District of Columbia. 17443. '86. (I)

BAIRD'S DOLPHIN, *Delphinus delphis* (skull), from Monterey, California; whalebone of California Gray Whale; *Rhachianectes glaucus*, from San Luis Obispo.
C. H. TOWNSEND, U. S. Fish Commission. 17444. '86. (XII)

PORPOISE, *Tursiops tursio* (skulls), from North Carolina.
WILMINGTON OIL AND LEATHER WORKS, Wilmington, North Carolina. 17445. '86. (XII)

OIL OF PEPPERMINT, "White Crystal," and one bottle of Pipmenthol.
W. S. THOMPSON, Washington. 17446. '86. (I)

TRENTON FOSSILS (2,183 specimens) from Nevada.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17447. '86. (XIII, A)

DEVONIAN INVERTEBRATE FOSSILS (213 specimens).
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17448. '86. (XIII, A)

PERUVIAN NEEDLES (2), from Florida.
HENRY WEIDENBACH, Washington, District of Columbia. 17449. '86. (II, A)

STONE IMPLEMENT and three arrow-heads, found in Fairfax County, Georgia.
HENRY WEIDENBACH, Washington, District of Columbia. 17449. '86. (III)

COIN. Confederate half-dollar in white metal struck from original die made at New Orleans in 1862.
ALEXANDER SCOTT, Washington, District of Columbia. 17450. '86. (I)

CONFEDERATE PAPER MONEY.
Four five-dollar bills.
Eight ten-dollar bills.
Two twenty-dollar bills.
Dr. WILLIAM OVERTON, Stoney Creek, Virginia. 17451. '86. (I)

CONFEDERATE PAPER MONEY.
Five-dollar bill, 1864.
Two ten-dollar bills, 1864.
Two twenty-dollar bills, 1864.
Seventy-five cents, corporation of Danville, 1861.
Twenty cents, Bedford County, Virginia, 1862.
Fifteen cents, Augusta County, Virginia, 1862.
Thirty cents, city of Richmond, 1862.
Twenty-five cents, North Carolina, 1862.
NORMAN V. RANDOLPH, Richmond, Virginia. 17452. '80. (I)

PAPER MONEY. Un real, El Banco Provincial de Santa Fé, Rosario, 1 de Noviembre 1874.
Un peso. La Provincia de Buenos Ayres, Moneda Corriente, 1869.
Diez y seis centisimos fuertes, Un Banco de la Provincia de Buenos Ayres, 1869.
ROBERT R. EDGAR, Estacion Burzaco, Buenos Ayres, South America. 17453. '86. (I)

MILITARY PASS to Alexandria, dated Washington, May 26, 1864, and oath of allegiance to the United States, dated May 3, 1865.
WILLIAM B. COOPER, U. S. National Museum. 17454. '85. (I)

PAPEL MONEY, etc.
Spanish dollars, 1776 and 1777.
Continental dollars, 1776 and 1778.
State currency of Tennessee and Mississippi.
Confederate paper money, coupon bonds, and certificates (31 specimens).
Mrs. E. REEKIE, Washington, District of Columbia. 17455. '86. (I)

MADREPORE MARBLE.
CHARLES CITY MARBLE COMPANY, Charles City, Iowa. (Through J. S. Trigg.) 17456. '86. (XVII)

WINE FLASKS (picolo), from Italy
GEORGE H. BOEHMER, Smithsonian Institution. 17457. '86. (II, A)

SAW-FISH, *Pristis cuspidatus*, (blade), from Madras, India.
WILLIAM H. DALL, U. S. Geological Survey. 17458. '86. (VII)

ETHNOLOGICAL OBJECTS. Four water-brushes, pair of slippers, from India; cap, woven basket made by the Rogue Indians, Oregon; ladies satchel, from Canton, China.
W H. DALL, U. S National Museum. 17458. '86. (VII)

BLACK BEAR, *Ursus americanus*.
Dr. W. W. GODDING, Government Asylum for the Insane, Washington, District of Columbia. 17459. '86. (IV)

SWISS IBEX, *Capra ibex*, Linné (skin of head, and skeleton).
ZOÖLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania. 17460 '86. (IV)

PRAYER-BOOK, used by the army and navy of the Confederate States, printed at Richmond, 1865.

Dr. R. A. BROCK, Richmond, Virginia. 17461. '86. (I)

STONE CARVING, of Egyptian scarabæus, obtained at Thebes, 1864; also a piece of wall-paper one hundred and twenty-five years old.

WILLIAM H. DALL, U. S. Geological Survey. 17462. '86. (II, A)

STEEL ENGRAVING. Original steel-plate engraving of Trumbull's Washington, taken from Yale College portrait, 1 steel-roll, 1 steel plate, "the transfer." (Deposited). Ten proofs taken from the above plates, four proofs of the American eagle, showing four stages of the engraver's work, and one sheet of gelatine tracing-paper. (Presented).

BUREAU OF ENGRAVING AND PRINTING, Washington, D. C. 17463. '86. (I)

KEY to the old War Department Building.

Mrs. ALICE CAMP, Washington, D. C. 17464. '86. (I)

BIRD SKINS. Four species, among them *Brachyramphus perdix* Pall, hitherto confounded with *B. marmoratus*, from Kamtschatka. (Exchange.)

Dr. L. STEJNEGER. U. S. National Museum. 17465. '86. (V, A)

OIL from the stomach of *Eulamia milberti*, taken off Cape Hatteras.

U. S. FISH COMMISSION, Washington, D. C. 17466. '86. (I)

PAPAL MILITARY MEDAL, bronze, 1849.

GEORGE H. BOEHMER, Smithsonian Institution. 17467. '85. (I)

INSECT, *Telea polyphemus*, for examination.

M. LOOMIS, Terra Alta, Preston County, West Virginia. 17468. '86. (X)

DRUGS, from New Grenada; for examination.

FREDERICK STEARNS & Co., Detroit, Michigan. 17469. '86. (I)

RED-BELLIED TERRAPIN, *Chelopus insculptus*.

GEORGE H. TOLBERT, Battery Station, Havre de Grace, Maryland. 17470. '86. (VI)

INDIAN IMPLEMENT, CAST OF. An alligator-shaped object of white jaspery flint.

C. ARMSTRONG, Carrollton, Ill. 17471. '86. (III)

SNOW-SHOES, used in the Adirondack Mountains. (Deposited.)

Capt. CHARLES E. BENDIRE, U. S. A., U. S. National Museum. 17472. '86. (II, A.)

CHINESE STOCKINGS (one pair).

Miss DOLLIE LEECH, Washington, D. C. 17473. '86. (II, A)

FOSSILS, including representations of 44 species of well-preserved fossils.

H. C. POWERS, Beloit, Wis. 17474. '86. (XIII, A)

OWL, *Bubo virginianus*, a very fine specimen in unusually dark plumage.

A. F. WOOSTER, Norfolk, Connecticut. 17475. '86. (V, A)

GARNET, of the variety colophonite, an interesting occurrence.

OTTO E. REIMER, Santiago de Cuba. (Through Department of State.) 17476. '86. (XVI)

SHALY ROCK, for examination.

Dr. W. S. OVERTON, Stony Creek, Virginia. 17477. '86. (XVII)

MINERALS.

GEORGE P MERRILL, U. S. National Museum. 17478. '86. (XVI)

TOURMALINE IN QUARTZ.

Prof. THOMAS ROBINSON, Howard University, Washington, District of Columbia. 17479. '86. (XVI)

BOOK. "Laws of Virginia in force in 1802."
Prof. G. BROWN GOODE, U. S. National Museum. 17480. '86. (?)

MEXICAN PLANTS, a valuable collection.
E. WILKINSON, Mansfield, Ohio. 17481. '86. (XV)

BLEACHED SHELLAC and Button lac.
DENNISON MANUFACTURING COMPANY, Philadelphia, Pennsylvania. 17482. '86. (I)

FISHES, *Pollachius, Gadus, Phycis, Liparis, Cyclopterus, Cottus and Synodus* juv.
VINAL N. EDWARDS, Wood's Holl, Massachusetts. 17483. 86. (VII)

TWIGS AND LEAVES of sugar-bearing oak, from McCloud River, California.
LIVINGSTON STONE, Dublin, New Hampshire. 17484. '86. (II)

GRAYHOUND, *Canis familiaris*, in the flesh.
Dr. EMIL BESSELS, Washington, District of Columbia. 17485. '86. (XII)

LIZARD, *Opheosaurus ventralis*, from Orangeburgh, South Carolina.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. 17486. '86. (XI)

YOUNG ALLIGATOR. Don or not known. 17487. '86. (XII)

ROSEATE SPOONBILL, *Ajaja ajaja*, Florida Screech Owl, *Scops floridanus*, and Marbled Godwit, *Limosa fedoa*, from Thousand Isles, Florida.
E. C. GREENWOOD, Osprey, Florida. 17488. '86. (V, A)

NEST OF RUBY-THROATED HUMMING-BIRD, *Trochilus colubris* Linn.
GEORGE L. MEAZELL, Middlebrook, Montgomery County, Maryland. 17489. '86. (BB)

FOSSIL WOOD, from the new reservoir near Howard University, District of Columbia.
JOHN WATSON, Washington, District of Columbia. 17490. '86. (XV)

BASKETS made by the Indians of Lachine Village near Montreal; also a small collection of beads from India, used by the poorer classes.
WILLIAM H. DALL, U. S. Geological Survey. 17491. '86. (II, A)

FOSSIL PLANTS, from Allegany County, New York.
WILLIAM H. DALL, U. S. Geological Survey. 17491. '86. (XIV)

IRON ORE, probably from Lake Superior region.
WILLIAM H. DALL, U. S. Geological Survey. 17491. '86. (XVIII)

ORE containing gray material; for examination.
MAX MEYERS, Sheridan, Montana Territory. 17492. '86. (XVIII).

TETRADYMITE, for examination.
BUSH AND MEYERS, Sheridan, Montana Territory. 17493. '86. (XVIII)

"GLOW WORM," *Phengodes;* for examination.
J. W. A. WRIGHT, Greensborough, Alabama. 17494. '86. (X)

GOLD-BEARING ROCKS, for examination.
M. W. WHATLEY, Idaho, Alabama. 17495. '86. (XVIII)

HORNED OWLS (necks and tongues of two specimens), for examination.
CHARLES RUBY, Fort D. A. Russell, Wyoming. 17496. '86. (XI)

GOPHERS, *Spermophilus richardsoni* and *Thomomys talpoides* (skins).
CHARLES RUBY, Fort D. A. Russell, Wyoming. 17496. '86. (IV)

FOSSIL WOOD AND BERRIES, from South Carolina.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through Frank Burns.) 17497. '86. (XIV)

FULLERS (2), from Orangeburgh, South Carolina.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through Frank Burns.) 17497. '86. (I)

TILES from Holland; bricks from a corner-stone of the old court-house in Orangeburgh, South Carolina.
U. S. GEOLOGICAL SURVEY, Washington, District of Columbia. (Through Frank Burns) 17497. '86. (I)

BLENHEIM SPANIEL. (Deposited.)
Hon. THOS. W. PALMER, Washington, District of Columbia. 17498. '86. (IV)

OIL, from Costa Rica.
TINOCO & VOLIO, San José, Costa Rica. (Through Felipe Chamberlain.) 17499. '86. (I)

KING RAIL, *Rallus elegans* (head and foot), for examination.
JUNIUS P. LEACH, Rushville, Illinois. 17500. '86. (XII)

MINERALS, for examination.
CHARLES MILLER, Jr., Sanborn, New York. 17501. '86. (XVI)

AMERICAN HERCULES BEETLE, *Dynastes tityus*.
Dr. J. S. HUNTER, Paragould, Green County, Arkansas. 17502. '86. (X)

MINERALS, from Washington Territory.
JOHN J. BURNS, Sprague, Lincoln County, Washington Territory. 17503. '86. (XVI)

ORES, from West Virginia.
TIMOTHY NIHON, Hedgesville, Berkeley County, West Virginia. 17504. '86. (XVIII)

QUARTZ and impure siderite, black band iron ore, for examination.
Hon. W. L. WILSON, House of Representatives. 17505. '86. (XVIII)

MANGANESE ORE, for examination.
H. W. H. JAMES, Fort Reno, Texas. 17506. '86. (XVIII)

LIMONITE, brown iron ore, impure limonite, and bog-iron ore.
HENRY C. MOYER, Hilltown, Pennsylvania. 17507. '86. (XVIII)

BIRD SKINS, for examination.
WILLIAM BREWSTER, Cambridge, Massachusetts. 17508. '86. (V, A)

SHELL. *Lucina acutilineata* Conr., from Washington Territory.
H. E. DORE, Portland, Oregon. 17509. '86. (XVI)

DOLOMITE, from San Luis Obispo, California.
H. E. DORE, Portland, Oregon. 17509. '86. (XVI)

FOSSILS, for examination.
H. E. DORE, Portland, Oregon. 17509. '86. (X)

SHELL, *Unio metanevrus*, from Neosho River, Kansas, for examination.
Dr. W. S. NEWLON, Oswego, Kansas. 17510. '86. (IX)

CRUDE PETROLEUM (surface).
C. L. MITCHELL, Eagle Pass, Texas. 17511. '86. (XVIII)

SEA SNAIL, *Liparis lineata*.
W. HERRICK, Swan's Island, Maine. 17512. '86. (VII)

BRASS IDOL, from Japan.
A. F. WOOSTER, Norfolk, Connecticut. 17513. '86. (II, A)

BROWN GREASE, for examination.
T. M. WARE & Co., Boston, Massachusetts. 17514. '86. (I)

POWDERED ORE.
C. CONOVER, El Dorado Cañon, Lincoln County, Nevada. 17515. '86. (XVIII)

LIMONITE and schistose rock, for examination.
JOSEPH HOFFSTETTER, Grangeville, Idaho. 17516. '86. (XVIII)

STONE used in playing an Indian game called "Chungkee."
Mrs. ELLING SHUPING, Nokomis, Illinois. 17517. '86. (XII)

TWIGS injured by the Wooly Aphis, *Schizoneura lanigera.*
J. B. ROSBOROUGH, Salt Lake City, Utah. 17518. '86. (X)

FOSSIL PLANT, probably a part of the stem of *Stigmaria.*
Mrs. JULIA L. SINKS, Giddings, Lee County, Texas. 17519. '86. (XIV)

FOSSIL SHELLS, *Sphærium sulcatum* and *Limnæa caperta*, for examination.
ROBERT HAY, Junction City, Kansas. 17520. '86. (X)

STONE AXE. (Returned.)
Dr. JOHN J. FULLMER, Philadelphia, Pennsylvania. 17521. '86. (III)

GAR-FISH, *Lepidosteus* sp. (scales).
Rev. C. M. CALDWELL, Hopkinsville, Christiansburgh, Kentucky. 17522. '86. (VII)

ORES, for examination.
N. W. MOOD, Leavenworth, Indiana. 17523. '86. (XVIII)

SEA MOUSE, *Aphrodite aculeata*, for examination.
W. W. HALL, Orleans, Massachusetts. 17524. '86. (XI)

GARNET ROCK, for examination.
FRED L. LEWIS, Moriah, Essex County, New York. 17525. '86. (XVI)

STONE IMPLEMENT, for examination.
Miss MOLLIE OZELLA SWINT, Graham, Alabama. 17526. '86. (III)

LIZARD, for examination.
W. C. ALLEN, Ellijay, Georgia. 17527. '86. (VI)

STONE AXE, for examination.
T. S. EASLEY, Centreville, Tennessee. 17528. '86. (II)

GOLD-FISH, *Carassius auratus*, from Potomac River.
CHARLES WALLACE, Fredericksburgh, Virginia. 17529. '86. (VII)

GYPSUM, with other sulphates, and calcite, for examination.
W. F. WILSON, Daggett, California. 17530. '86. (XVIII)

WOOD-RAT. *Neotoma floridana.*
G. NOBLE, Savannah, Georgia. 17531. '86. (IV)

STONE PIPE, from Mercer County, Kentucky. (Returned.)
R. W. MERCER, Cincinnati, Ohio. 17532. '86. (III)

SANDSTONE with scales of white mica, for examination.
S. S. MITCHELL, Columbus, Mississippi. 17533. '86. (XVII)

COMMON SHREW MOUSE, *Blarina talpoides* (4 specimens), for examination.
L. H. SMITH, Strathroy, Ontario, Canada. 17534. '86. (IV)

PYRITE IN QUARTZ, from Rock Creek, District of Columbia, for examination.
D. H. MCPHERSON, Washington, District of Columbia. 17535. '86. (XVIII)

CHEWINK (Towhee), *Pipilo erythrophthalmus* Linn, for examination.
JAMES W. ROGAN, Rogersville, Tennessee. 17536. '86. (V, A)

ORES, for examination.
O. WHITCOMB, Leavenworth, Indiana. 17537. '86. (XVIII)

BIRD SKIN. Borrowed for examination and returned.
CINCINNATI SOCIETY OF NATURAL HISTORY, Cincinnati, Ohio. 17538. '86. (V, A)

BIRD SKIN, for examination.
W. C. KNIGHT, Lincoln, Nebraska. 17539. '86. (V, A)

ORE, for examination.
C. P. MCGIMSEY, Arkadelphia, Arkansas. 17540 '86. (XVIII)

SCALES of glistening mica.
Hon. JOHN H. ROGERS, House of Representatives. 17541. '86. (XVIII)

BARK, for examination.
GEORGE M. RAND, North Park, Larimer County, Colorado. 17542. '86. (I)

AMERICAN HERCULES BEETLE, *Dynastes tityus*.
R. M. MILLER and SONS, Charlotte, North Carolina. 17543. '86. (X)

ORE, for examination.
Mrs. IRENE S. COWLES, Medford, Jackson County, Oregon. 17544. '86. (XVIII).

ORE, for examination.
Hon. I. G. HARRIS, United States Senate. 17545. '86. (XVIII)

BEAN WEAVILS. *Bruchus obsoletus*, for examination.
R. J. HAIGHT, Davenport, Iowa. 17546. '86. (X)

STONE DISK, sword-shaped object, and chipped implement, from Humphreys County, Tennessee. (Returned.)
EDWARD D. HICKS, Nashville, Tennessee. 17547. '86. (III)

BIRD SKINS, for examination. (Returned.)
Dr. P. L. SCLATER, London, England. 17548. '86. (V, A)

ROCK, for examination.
D. W. SAVAGE & CO., Dayton, Washington Territory. 17549. '86. (XVII).

BIRD SKINS. (Returned.)
GEORGE N. LAWRENCE, New York, New York. 17550. '86. (V, A)

GREAT WATER-BUG, *Belostoma americana*.
JOSEPH A. HAYWOOD, Raleigh, North Carolina. 17551. '86. (X)

FOSSIL PLANTS, from Mosquito Valley, Pennsylvania.
JOHN C. HAMMER, Williamsport, Pennsylvania. 17552. '86. (XIV)

FOSSIL, *Orthoceras* sp., from Neosho River, for examination.
Dr. W. S. NEWLON, Oswego, Kansas. 17553. '86. (XIII, A)

GREAT WATER-BUG, *Belostoma americana*, for examination.
C. B. EDWARDS, Raleigh, North Carolina. 17554. '86. (X)

GREAT AMERICAN WATER-BUG, *Belostoma americana*, and a *Cybister fimbriolatus*.
N. A. RAMSEY, Durham, North Carolina. 17555. '86. (X)

GREAT WATER-BUG, *Belostoma americana*, for examination.
W. S. PRIMROSE, Raleigh, North Carolina. 17556. '86. (X)

QUARTZ and chloritic material, for examination.
C. OVERMAN, Grangeville, Idaho. 17557. '86. (XVIII)

WHITE-FOOTED OYSTER CATCHER, *Hæmatopus leucopus*, for examination.
AMERICAN MUSEUM OF NATURAL HISTORY, New York, New York. 17558. '86. (V, A)

INSECTS, for examination.
Mrs. H. K. MORRISON, Morgantown, North Carolina. 17559. '86. (X)

MARL, for examination.
J. F. BUMBALOUGH, Shingle, White County, Tennessee. 17560. '86. (XVIII)

ORE, for examination.
Mrs. IRENE S. COWLES, Medford, Oregon. 17561. '86. (XVIII)

MAGNESITE, for examination.
Hon. W. S. ROSECRANS, Washington, District of Columbia. 17562. '86. (XVIII)

ARROW-HEADS. (Returned.)
R. W. MERCER, Cincinnati, Ohio. 17563. '86. (III)

SAND, consisting of rounded grains of quartz, for examination.
Hon. E. BARKSDALE, House of Representatives. 17564. '86. (XVIII)

DOWNY PETREL, *Æstrelata mollis* (mounted specimens).
ACADEMY OF NATURAL SCIENCES, Philadelphia, Pennsylvania. 17565. '86. (V, A)

RABBIT, *Lepus sylvaticus*, for examination. (Returned.)
F. W. CRAGIN, Topeka, Kansas. 17566. '86. (IV)

BLACK-CAPPED PETREL, *Æstrelata hæsitata* and White-footed Oyster Catcher, *Hæmatopus leucopus*, for examination.
BOSTON SOCIETY OF NATURAL HISTORY, Boston, Massachusetts. 17567. '86. (V, A)

INSECTS, *Buprestis lauta*, for examination.
R. M. KING, Hawthorne, Nevada. 17568. '86. (X)

GREAT WATER-BUG, *Belostoma americana*.
POST-OFFICE DEPARTMENT, Washington, District of Columbia. 17569. '86. (X)

CRINOID FOSSIL, joint or plate of the supporting column of a crinoid.
W. EDGAR TAYLOR, College Springs, Iowa. 17570. '86. (XIII, A)

FIBER AND BARK of *Hibiscus moscheutos* L., for examination.
HARVEY C. MEDFORD, Tupelo, Mississippi. 17571. '86. (XV)

ORE, from Sonora, Mexico. (Returned.)
W. JOHNSON, Tucson, Arizona. 17572. '86. (XVIII)

RED-BACKED JUNCO, *Junco cinereus dorsalis*, and Arizona Junco, *Junco cinereus palliatus*, for examination.
AMERICAN MUSEUM OF NATURAL HISTORY, New York City. 17573. '86. (V, A)

SILK CULTURE EXHIBIT, displayed at New Orleans Exposition.
WOMEN'S SILK-CULTURAL ASSOCIATION, Philadelphia, Pennsylvania. 17574. '86. (I)

ORES, for examination.
R. E. COOK, Alpine, Talladega County, Alabama. 17575. '86. (XVIII)

COMMON GRAY SQUIRREL, *Sciurus carolinensis* (3 specimens), for examination.
OLIVER MERCY, Northwestern University, Eveston, Illinois. 17576. '86. (IV)
MAT ROLLER, Hot Springs, Arkansas. 17577. '86. (X)

SEED of *Agrostis* sp.
MAT ROLLER, Hot Springs, Arkansas. 17578. '86. (XV)

IMPURE LIMESTONE, for examination.
JOHN K. SCOTT, Mount Lee, Hernando County, Florida. 17579. '86. (XVII)

JUTE, COTTON, and other vegetable fibers, for examination.
REUBEN BROOKS, Gloucester, Massachusetts. 17580. '86. (I)

SPICULÆ, from the stomach of a Red-throated Diver, for examination.
Dr. E. STERLING, Cleveland, Ohio. 17581. '86. (VII)

POLYPHEMUS MOTH, *Telea polyphemus*.
J. S. WEBB, Hicksford, Virginia. 17582. '86. (X)

INSECT, *Amnesia granicollis*.
R. D. NEVINS, Olympia, Washington Territory. 17583. '86. (X)

STONE RELICS (625 specimens). (Purchased.)
G. W. CLEMENTS, Midway, Boone County, Missouri. 17584. '86. (I)

STONE RELICS. (Returned.)
J. R. NISSLEY, Mansfield, Ohio. 17585. '86. (III)

MINERAL, for examination.
HARVEY C. MEDFORD, Tupelo, Mississippi. 17586. '86. (XVI)

ORE, for examination.
WILLIAM CRAIG, Payson, Arizona. 17587. '86. (XVIII)

IRON PYRITES, for examination.
JOHN W. MCGEE, Seattle, Washington Territory. 17588. '86. (XVI)

STONE IDOL, clay idol, stone implements, and pottery, for examination.
T. L. WHITEHEAD, Dexter, Missouri. 17589. '86. (III)

NOCTURNAL HAWK MOTH, *Triptigon modesta.*
Col. A. G. BRACKETT, U. S. Army, Fort Davis, Texas. 17590. '86. (X)

COAL, for examination.
Hon. W. S. ROSECRANS, Washington, District of Columbia. 17591. '86.

IRON PYRITES, for examination.
E. H. POE, Hatton, Polk County, Arkansas. 17592. '86. (XVI)

CAROLINA SPHINX, *Sphinx carolina.*
JOHN S. WEBB, Totaro, Virginia. 17593. '86. (X)

SILICATE OF ALUMINA, with carbonate of lime, for examination.
WILLIAM R. MAY, Nephi, Juab County, Utah. 17594. '86. (XVI)

FERRUGINOUS CLAY, from Wheelersville, Pennsylvania.
R. P. JANNEY, Washington, District of Columbia. 17595. '86. (XVIII)

COINS, Greek and other ancient, and mediæval countries (177 specimens), for examination.
MILES W. GRAVES, Hartford Connecticut. 17596. '86. (I)

WHITE QUARTZ, for examination.
W. W. WHATLEY, Idaho, Clay County, Alabama. 17597. '86. (XVI)

FERRUGINOUS SANDSTONE (decomposed), for examination.
MICHAEL DOOLEY, Lonaconing, Maryland. 17598. '86. (XVIII)

INSECT, for examination.
B. F. STALKER, New Providence, Indiana. 17599. '86 (X)

DWARF MILKWEED, *Asclepias verticellata* L., for examination.
Dr. R. M. WELLS, Plant City, Florida. 17600. '86. (I)

IRON ORE.
L. W. LEDYARD, Cazenovia, New York. 17601. '86. (XVIII)

PLANT: Specimens of Ginkgo, *Ginkyo biloba* L., from China.
H. L. FISHER, Ringoes, Hunterdon County, New Jersey. 17602. '86. (XV)

MINERAL, for examination.
B. A. SHEPLEY, Des Arc, Iron County, Missouri. 17603. '86. (XVI)

FERRUGINOUS SANDSTONE (decomposed), for examination.
MICHAEL DOOLEY, Lonaconing, Maryland. 17604. '86. (XVII)

MASTODON, *Elephas* sp., bones and teeth found 30 feet below the ground, for examination.
Dr. A. G. CHASE, Millwood, Kansas. 17605. '86. (IV)

FOSSIL TOOTH, for examination.
S. J. KIRKPATRICK, Jonesboro, Tennessee. 17606. '86. (VIII.)

FOSSIL TOOTH, molar of *Mastodon americanus*, for examination. (Returned.)
E. W. SPAULDING, Shasta, California. 17607. '86. (VIII)

MOTH, *Actias luna*, for examination.
H. C. BUHL, College Hill, Ohio. 17608. '86. (X)

DECOMPOSED ROCKS, for examination.
C. N. EARL, Los Angeles, California. 17609. '86. (XVIII)

MINERALS, for examination.
R. H. POTTER, Riverside, California. 17610. '86. (XVI)

MICA SCHIST, for examination.
JULIUS SCHERR, Eglon, West Virginia. 17611. '86. (XVI)

PYRITE, for examination.
D. J. MCDONALD, Arkadelphia, Arkansas. 17612. '86. (XVII)

ANCIENT COINS, for examination.
MILES W. GRAVES, Hartford, Connecticut. 17613. '86. (I)

QUARTZ PEBBLES; also minute and water-worn fragments of quartz and feldspar, for examination.
F. A. SCHEFFLER, Orangeburgh, South Carolina. 17614. '86. (XVI)

INSECTS, *Attus insulus* and *Phalangium* sp., for examination.
JOHN L. CURTIS, Oakland, California. 17615. '86. (X)

INSECTS, for examination. From Bogota, New Granada.
FREDERICK STEARNS & CO., Detroit, Michigan. 17616. '86. (X)

BIRD SKINS, for examination.
FREDERICK STEARNS & CO., Detroit, Michigan. 17616. '86. (V, A)

CALCITE and impure manganiferous iron ore, for examination.
J. F. BUMBELOUGH, Shingle, White County, Tennessee. 17617. '86. (XVI)

PLANT, flower of *Helianthus* sp.
JAMES W. ROGAN, Rogersville, Tennessee. 17618. '86. (XV)

ANTIQUITIES. The Fisher collection of Mexican antiquities, consisting of obsidian flakes and ores, arrow and spear heads, cutlasses, celts, pendants, iron pyrites, stone carvings, stone cylinder, spindle-whorls, musical instruments, pipes, etc. (633 specimens). (Purchased.)
W. W. BLAKE, Kansas City, Missouri. 17619. '86. (III)

WATER, for examination.
E. MORGAN, Midlothian, Ellis County, Texas. 17620. '86. (XVII)

POTTERY. Indian vases (24) found in mounds. (Purchased.)
W. J. BAKER, Golden Lake, Arkansas. 17621. '86. (II, B)

PLANT, *Hydrocotyle repanda*, from Mississippi, for examination.
Hon. JAMES Z. GEORGE, U. S. Senate. 17622. '86. (XV)

MINERAL, for examination.
JOSEPH UPTON, Charleston, North Carolina. 17623. '86. (XVI)

POTTERY (3 pieces). String of beads and bone implements.
LANDON AND MCCONNELL, Lawrence, Kansas. 17624. '86. (II, B)

CONCRETIONS (3), from Fort Custer, Mont. (Deposited.)
Capt. CHARLES E. BENDIRE, U. S. A., U. S. National Museum. 17625. '86. (III)

SWAINSON'S WARBLER, *Helinaia swainsoni*.
T. D. PERRY, Savannah, Georgia. 17626. '86. (V, A).

WHITE BRICKS, supposed to be one hundred and fifty years old; among the first made in South Carolina.
Dr. SALLEY and Mr. RIGGS, Orangeburgh, South Carolina. 17627. '86. (I)

INSECT, *Lucanus elephas*.
Mrs. RICHARD CARTER, Cloverport, Kentucky. 17628. '86. (X)

MINERAL, for examination.
T. J. TURPIN, Grangeville, Idaho. 17629. '86. (XVI)

GLOBULAR PYRITES in limestone.
Dr. G. P. HACHENBERG, Austin, Texas. (Through Dr. J. S. Billings, U. S. A.) 17630. '86. (XVI)

GILA MONSTER, *Heloderma suspectun*.
Maj. ANSON MILLS, Fort Thomas, Arizona. 17631. '86. (VI)

HORNED TOADS, *Phrynosoma coronatum* (15 specimens). (Purchased.)
Miss ROSA SMITH, San Diego, California. 17632. '86. (VI)

GAME OF BATTLEDORE AND SHUTTLECOCK.
HENRY HORAN, U. S. National Museum. 17633. '86. (II, A)

MAP OF TOKYO: 10 volumes of a work on the natural products of Japan, by Dr. Ito Keiski, and a scroll containing an inscription upon a stone tablet commemorating the repairs on the temple of Chêng Hwang Meau, with a translation by the donor.
Dr. D. B. MCCARTEE, Washington, District of Columbia. 17634. '86. (II, A)

CEDAR BARK BEETLE, *Pholocosinus dentatus.*
WARREN KNAUS, Selina, Kansas. 17635. '86. (X)

LARVA of *Polycaon confertus*; also work of the larva.
L. E. RICKSECKER, Sylvania, California. 17636. '86. (X)

LARVA of *Psephenus haldemanni.*
FRED L. BUTTON, Oakland, California. 17637. '86. (X)

AMBER containing insects (15 specimens), from the Baltic Sea. (Exchange.)
WEST PRUSSIAN PROVINCIAL MUSEUM, Danzig, Prussia. 17638. '86. (XVI)

MINERALS, for examination.
E. H. POE, Hatton, Polk County, Arkansas. 17639. '86. (XVI)

SCOTT'S ORIOLE, *Icterus parisorum* (skeleton).
J. B. BOWMAN, Aleman, New Mexico. 17640. '86. (XII)

PHOTOGRAPHS of Indian implements.
H. G. HODGE, York, Clark County, Illinois. 17641. '86. (III)

HORNED TOADS, *Phrynosoma coronatum* (5 specimens). (Purchased.)
Miss ROSA SMITH, San Diego, California. 17642. '86. (VI)

COAL, for examination.
R. JACOB WEISBACH, Tacoma, Washington Territory. 17643. '86. (XVIII)

BARRED OWLS, *Syrnium nebulosum*, from Montgomery County, Maryland.
JOHN P. HAMLIN, Washington, District of Columbia. 17644. '86. (V, A)

GREAT HORNED OWL, *Bubo virginianus* Gm., from Colorado.
Col. JAMES STEVENSON, Washington, District of Columbia. 17645. '86. (V, A)

ELK SKULL and antlers, *Cervus canadensis.*
Hon. L. Q. C. LAMAR, Washington, District of Columbia. 17646. '86. (IV)

INSECT, *Gryllotalpa* sp.
JOHN PRICE, Nevada, Ohio. 17647. '86. (X)

DRAWINGS and copy of a description of the Temple of Bôrô Boudour, in the Island of Java.
NETHERLANDS GOVERNMENT. (Through Department of State.) 17648. '86. (II, A)

CASTS of stone relics. An unfinished ceremonial ax, from Shelby County, Ohio, and a boat-shaped object, from Grant County, Indiana.
J. R. NISSLEY, Mansfield, Ohio. 17649. '86. (III)

OÖLITE (3 specimens), from Bath, England.
SAMUEL GARDNER, Washington, District of Columbia. 17650. '86. (XVII)

AZTEC WHISTLE, from Mexico.
Mrs. M. E. BROWN, Orange, New Jersey. 17651. '86. (I)

STURGEON'S HEAD.
E. G. BLACKFORD, New York City. 17652. '86. (XII)

HORNED TOADS, *Phrynosoma coronatum* (40 specimens). (Purchased.)
Miss ROSA SMITH, San Diego, California. 17653. '86. (VI)

CARIB STONES, four celts and thirty-one axes.
L. GUESDE, Pointe-à-Pitre, Guadeloupe. 17654. 86. (III)

SHELL FISH-HOOK, from Vancouver Island.
STEPHEN JANUS. Washington, District of Columbia. 17655. '86. (II, A)

BASKETS, made of birch-bark, wood, and grass, from the Passamaquoddy Indians, Maine.

Mrs. FANNIE PATTANGALL, Washington, District of Columbia. 17656. '86. (II, A)

PHOTOGRAPHS of the present Emperor and Empress of Japan. (Deposited.)

Dr. D. B. MCCARTEE, Washington, District of Columbia. 17657. '86. (II, A)

POTTERY, and a fragment of bones and teeth.

OSCEOLA BUTLER, Adamsville, Tennessee. 17658. '86. (II, B)

BLACK-FOOTED FERRET, *Putorius nigripes* (skeletons.) (Purchased.)

A. B. BAKER, Banner, Trego County, Kansas. 17659. '86. (XII)

BLACK-FOOTED FERRET, *Putorius nigripes*. (Purchased.)

A. B. BAKER, Banner, Trego County, Kansas. 17659. '86. (IV)

SNAKE, *Heterodon platyrhinus*.

J. H. KUEHLING, Washington, District of Columbia. 17660. '86. (VI)

SEALING WAX. Additional specimens to accession 17367.

DENNISON MANUFACTURING COMPANY, Philadelphia, Pennsylvania. 17661. '86. (I)

CHESTNUT-LEAF ROLLER, probably the work of a curculinoid, allied to *attelabus*.

S. R. HARRISON, Clarksburgh, West Virginia. 17662. '86. (X)

INDIAN RELICS. Pottery (61 pieces), two sinkers, one pestle, three gouges, arrow-heads (6 pieces), three needles, and a polishing-stone, for examination.

F. L. BECKER, Schoharie, New York. 17663. '86. (II, B)

VOLCANIC TUFA, bearing foot-tracks, from Nicaragua.

W. W. EVANS, Sans Souci, New Rochelle, New York. 17664. '86. (III)

MAMMAL SKINS, *Halmaturus ruficollis*, *Phascolarctos cinereus*, *Belideus breviceps*, *Phalangista vulpina*, from New South Wales; *Thylacinus cynocephalus* and *Sarcophilus ursinus*, from Tasmania.

AUSTRALIAN MUSEUM, Sydney, Australia, 17665. '86. (IV)

RACCOON, *Procyon lotor*.

MUSÉE L'HERMINIER, Pointe-à-Pitre, Guadeloupe. (Through L. Guesde.) 17666. '86. (IV)

SHELLS. *Strombus costatus* Gmel., *Cypræa exanthema* L., *Oliva reticularis*, *Pecten antillarum*, and *Lima scabra*.

MUSÉE L'HERMINIER, Pointe-à-Pitre, Guadeloupe. (Through L. Guesde.) 17666. '86. (IX)

FOREST MUSHROOMS.

MUSÉE L'HERMINIER, Pointe-à-Pitre, Guadeloupe. (Through L. Guesde.) 17666. '86. (XV)

CALCITE and native sulphur; also a specimen of bog-iron ore.

MUSEÉ L'HERMINIER, Pointe-à-Pitre, Guadeloupe. (Through L. Guesde.) 17666. '86. (XVI)

BIRD SKINS, *Parus atricapillus*, *Totanus flavipes*, *Nycticorax violaceus*, *Ardea herodias*, *Pelecanus fuscus*, *Gallinula galeata*, *Fulica caribæa*, *Hæmatopus palliatus*, *Podilymbus podiceps*, *Phaëthon æthereus*, *Falco columbarius*, *Symphemia semipalmata*, *Sterna fuliginosa*, *Limosa hæmastica*, *Dafila bahamensis*, *Ægialitis vociferus*, *Speotyto guadeloupensis*, *Charadrius dominicus*, *Thryothorus rufescens*, *Tyrannus rostratus*, and *Mniotilta varia*.

MUSÉE L'HERMINIER, Pointe-à-Pitre, Guadeloupe. (Through L. Guesde.) 17666. '86. (V, A)

SNAKE, *Coluber obsoletus obsoletus*.

H. P. HOARE, Phœbus, Virginia. 17667. '86. (VI)

STONE IDOL.
JOHN W. EMMERT. (Bureau of Ethnology.) 17668. '86.

MINERAL WATER, for examination.
SAINT CLAIR MINERAL SPRING COMPANY, Saint Clair, Michigan. 17669. '86 (XVI)

WHITE COCKATOO, *Cacatua sulphurea.*
Mrs. M. PARKS, Norfolk, Virginia. 17670. '86. (XII)

TIGER SALAMANDER, *Amblystoma tigrinum* (8 specimens).
Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 17671. '86. (VI

TIGER SALAMANDER, *Amblystoma tigrinum.*
Dr. BASIL NORRIS, U. S. Army, Spokane Falls, Washington Territory. 17672 '86. (VI)

INDIAN IMPLEMENT, for examination.
JEROME WILTSE, Falls City, Nebraska. 17673. '86. (III)

FLORIDA JAY (6 specimens), black and white shore-finches (2 specimens), Florid dusky ducks (1 pair). (Purchased.)
C. J. MAYNARD, Boston, Massachusetts. 17674. '86. (V, A)

SOAPSTONE (2 specimens), from a quarry belonging to W. W. Evans, District o Columbia.
Dr. WILLIAM S. MCILHENNEY, Washington, District of Columbia. 17675. '86 (XVIII)

METEORIC IRON (2 specimens). (Exchange.)
AMHERST COLLEGE, Amherst, Massachusetts. 17676. '86. (XVIII)

LAMPREY EELS, *Petromyzon marinus* (16 specimens).
S. E. MEEK, Cayuga, New York. 17677. '86. (VIII)

BADGES of the Travelers' Protective Association to the National Convention, Balti more, June, 1886. Illinois delegate and alternate.
FRANK J. ALLEN, Chicago, Illinois. 17678. '86. (I)

FISH, *Percina caprodes.*
THOMAS LEWIS, Roanoke, Virginia. 17679. '86. (VII)

TIGER SALAMANDERS, *Amblystoma tigrinum* (35 specimens).
Dr. R. W. SHUFELDT, U. S. Army, Fort Wingate, New Mexico. 17680. '86. (VI

GALENA, for examination.
WILEY R. HELM, Jamestown, Clinton County, Illinois. 17681. '86. (XVI)

AMERICAN HERCULES BEETLE, *Dynastes tityus.*
L. E. D. BERRY, Dawson's Cross-Roads, North Carolina. 17682. '86. (X)

STONE IMPLEMENT, for examination. Returned.
G. C. JONES, Brookfield, Connecticut. 17683. '86. (III)

MINERALS.
WAGNER INSTITUTE OF SCIENCE, Philadelphia, Pennsylvania. 17684. '86. (XVI

EEL POUT, *Zoarces anguillaris.*
HENRY M. LOW, Rockport, Massachusetts. 17685. '86. (VII)

MINERALS, for examination.
CHARLES S. H. BUCHANAN, Custer City, Dakota. 17686. '86. (XVI)

SEA WEED with barnacle attached, probably *Spartina stricta*, for examination.
I. JENKINS MIKELL, Edisto Island, South Carolina. 17687. '86. (XV)

ETHNOLOGICAL OBJECTS. See under Accession No. 17239 (Nos. 120–126.)
Lieut. P. H. RAY, U. S. Army, Fort Gaston, California. 17688. '86. (II, A)

EUROPEAN GOLDFINCH, *Carduelis carduelis*, in the flesh.
W. C. WEEDEN, U. S. National Museum. 17689. '86. (V, A)

BIRDS (7 species, 12 specimens), collected at Humboldt Bay, California.
CHARLES H. TOWNSEND, U. S. Fish Commission. 17690. '86. (V, A)

SNAIL, *Helix hortensis*.
Prof. J. H. MORRISON, Lexington, Virginia. 17691. '86. (IX)

PHOTOGRAPHS OF FISHES. *Caranx*, *Epinephalus*, *Enneacentrus*, *Glyphidodon*, *Calamus*, *Octopus*, etc., caught at Caroline Island, South Pacific Ocean, by M. Jaussen, Director of the French Eclipse Expedition.
EDWARD S. HOLDEN, Washburn Observatory, Madison, Wisconsin. 17692. (VII)

OAK, showing borings of a larva.
B. F. STALKER, New Providence, Indiana. 17693. '86. (X)

FOSSIL TEETH. *Equus* (? sp.) ? *fraternus*, superior canine and inferior molar, and *Dicotyles* sp. nov., superior canine, for examination.
JAMES W. ROGAN, Rogersville, Tennessee. 17694. '86. (VIII)

METEORIC IRON (4 small shavings), from Albuquerque, New Mexico.
L. G. EAKINS, Denver, Colorado. 17695. '86. (XVI)

COINS. Seal rings, scales, Roman brass image, music on parchment, with illumined sacred pictures by a monk of the twelfth century, shekel of the Saracens, Bactrian coin, medal, etc. (Deposited.)
JAMES AUSTIN, Washington, District of Columbia. 17696. '86. (I)

SCALE CARP, *Cyprinus carpio;* also the hook with which the specimen was caught.
W. B. JOHNSTON, Macon, Georgia. 17697. '86. (VII)

BUDDHIST SUTRAS. The sutras of Bowadlee's life; the sutras of Amitabha's life.
Dr. D. B. MCCARTEE, Washington, District of Columbia. 17698. '86. (II, A)

EUROPEAN GOLDFINCH, *Carduelis carduelis*.
W. C. WEEDEN, U. S. National Museum. 17699. '86. (V, A)

DIANA MONKEY, *Cercopithecus diana*, in the flesh.
ZOOLOGICAL SOCIETY OF PHILADELPHIA, Philadelphia, Pennsylvania. (Through Arthur Edwin Brown, Esq.) 17700. '86. (IV)

MIXTURE of graphite and fragments of various siliceous minerals with particles of organic matter.
I. A. COMERFORD, Spokane Falls, Washington Territory. 17701. '86. (XVII)

RED-SHOULDERED HAWK, *Buteo lineatus*.
JOHN K. WALKER, Parkersburgh, Illinois. 17702. '86. (V, A)

BRONZE COINS, from Corea (3); value about one-third cent each.
Lieut. W. A. MINTZER, U. S. Navy, Baltimore, Maryland. 17703. '86. (I)

CRYSTALS.
OTTO REIMER, United States Consul, Santiago de Cuba. (Through Department of State.) 17704. '86. (XVI)

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